1961 Volume 19, Issue 5

PREVENTION OF DETERIORATION

ABSTRACTS

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Prevention of Deterioration Center

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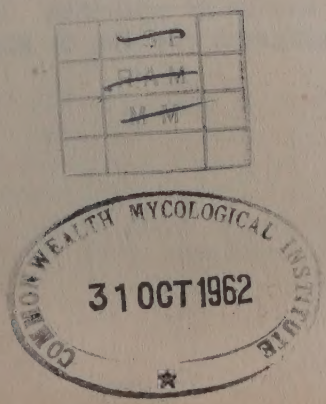

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for
Volume 19 Issue 5

Biological Agents

Microbiological corrosion in waterfloods Met 69. An introductory bibliography on microbial resistance of thermosetting plastics Plas 51. Resistance of organic materials to marine bacterial attack Plas 56. The use of bursting strength in assessing resistance of textiles to fungal attack Text 24. Compulsive decay test of building boards by some wood-destroying fungi Wood 58. A microscopic study of paper pigmented by the fungus Gymnoascus setosus Wood 62.

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1961 Biol 19
Vol.19 PDL-41106

Andreyevskii, I.L.
BACTERIAL ACTION ON PETROLEUM STRATUM (in Russian)
Priroda 47:90-91 (October 1958)

In the Yareg oil field a reduction of viscosity, specific gravity, and sulfur content of petroleum was observed over a period of several years. Laboratory studies revealed the presence in the petroleum strata of sulfate-reducing and denitrifying organisms, and also other, unidentified bacteria. Microbiological change occurring in petroleum fractions under laboratory conditions depended on the composition of the fractions, culture conditions, etc. For example, in the 250 to 400 C fraction, the action of microorganisms resulted in an increase of naphthenes and a reduction of methane components. The mazut (petroleum residue) fraction showed the highest reduction of specific gravity and viscosity. An analysis of petroleum water showed the absence of nitrates, sulfates, and phosphates, i.e., conditions of "nitrogen hunger," which evidently stimulate the utilization by bacteria of the heavy, nitrogen-containing petroleum fractions. This was confirmed in laboratory experiments. In the absence of nitrogen in the culture media, the heavy fractions were utilized to a large extent, whereas they remained unchanged in media containing nitrogen. Cultivation of bacteria on the light boiler fuel fraction in the presence of adequate nutrients resulted in an increase of tar and sulfur contents and specific gravity. These experiments indicate the possibility of improving the flow of petroleum by artificially creating a "nitrogen hunger," and thus promoting the degradation of the heavy petroleum fractions.

Bacteria, sulfur, nitrogen, petroleum, foreign

1961 Biol 20
Vol.19 PDL-41618

Obayashi, Yoji, Sunao Ota and Shiro Arai
SOME FACTORS AFFECTING PRESERVABILITY OF FREEZE-DRIED BACTERIA
J. Hyg. (Eng.) 59:77-91 (March 1961)

Sodium glutamate in the medium significantly enhances the stability of freeze-dried Lactobacillus bifidus - especially to heat. The higher the concentration of the bacillary suspension, the higher the optimal sodium glutamate level. Various drying media fall into two types in terms of degree of sublimation of the product during the process of freeze drying. With the first type, which included sodium glutamate and glucose, the sublimation rate diminished with increasing concentration of the medium; with the second type, which included polyvinyl pyrrolidon K90, soluble starch and dextran, no such diminution with increased concentration was observed. Combination of sodium glutamate or glucose with a type II medium promoted sublimation and enhanced the stabilizing effect of sodium glutamate on dried L. bifidus. The latter effect is attributed to a dessication-promoting effect of the type II medium. Sealing in air rather than in vacuum improved the survival rate of freeze-dried L. bifidus, but made no significant difference in the survival rates of other anaerobic organisms.

Bacteria, storage, lyophilization

PDL-41661

Webb, B.D., Mary E. Bayliss, and L.R. Richardson
RELATION ON INTERSPACE RELATIVE HUMIDITY TO GROWTH OF MOLDS AND HEATING IN FEED INGREDIENTS AND FEED MIXTURES
J. Agr. and Food Chem. 8:371-374 (September-October 1960)

Fungi, growth, humidity, temperature, storage, shelf life, animal feeds

1961 Biol 21
Vol.19 PDL-41642

Matthews, A.D., and P.N. Karnauchow
A SIMPLE TECHNIQUE FOR THE CULTIVATION OF ANAEROBES
J. Can. Med. Assoc. 84:793-794 (April 1961)

A simple, fast, inexpensive and clean method of cultivating anaerobes is described. An inoculated plate and Eh indicator (B.B.L. thioglycollate-resazurin broth incorporating 1.5% agar) in a 5 ml glass cup are inserted in a 7 by 6 in. polyethylene bag with one side 1/4 to 1/2 in. shorter than the other. To a 35 mm, fine porosity Seitz filter disc placed in a plastic or metal screw cap are added 0.6 to 1.0 gm dry powdered pyrogallic acid and 2 ml of a 50% aqueous solution of anhydrous sodium carbonate. The cap is inserted in the polyethylene bag and the bag immediately sealed with 3/4 in. cellulose tape and incubated.

The method produced good growth of Clostridium perfringens, C. tetani, C. sporogenes, and anaerobic streptococci within 18 to 24 hr incubation. The resazurin indicator changed from pink to yellow in about 4 hr indicating the anaerobic state of the environment. A similar technique using sodium carbonate and a weak solution of hydrochloric acid provides a carbon dioxide environment.

Bacteria, anaerobes, culture

PDL-40810

Ward, E.W.B., J.B. Lebeau, and M.W. Cormack (Canada. Dept. of Agriculture)
GROUPING OF ISOLATES OF A LOW-TEMPERATURE BASIDIOMYCETE ON THE BASIS OF CULTURAL BEHAVIOR AND PATHOGENICITY
Can. J. Botany 39:297-306 (March 1961)

Fungi, low temperature, classification

1961 Biol 22
Vol.19 PDL-41531

Gibbons, N.E., and John I. Payne (Alberta. University, Edmonton, Can.)
RELATION OF TEMPERATURE AND SODIUM CHLORIDE CONCENTRATION TO GROWTH AND MORPHOLOGY OF SOME HALOPHILIC BACTERIA
Can. J. Microbiol. 7:483-489 (August 1961)

The red halophiles, Halobacterium salinarium, H. cutirubrum, H. halobium, and Sarcina litoralis, grew most rapidly at salt levels of 20 to 25% at 40 to 45 C. Maximum turbidity was obtained at similar salt concentrations but at 35 to 40 C. An unidentified colorless rod grew most rapidly at 17.5 to 20% salt and 40 to 50 C, but produced maximum yield at 30 C. The rod forms changed from long slender rods through irregular shapes to spheres as the salt level was lowered. Except that cells were very irregular at temperatures above optimum, temperature had little or no effect on the morphology at any one salt level.

Bacteria, temperature, sodium chloride, growth, physiology

PDL-41604

Waksman, Selman A.
MICROBIOLOGY—YESTERDAY AND TODAY
Microbiology 29:217-222 (September/October 1960)

Microorganisms, history

PDL-41659

Stubbings, H.G.
FOULING AND ANTIFOULING
Research 14:309-314 (August 1961)

Foulers, toxics, review

1961 Biol 23
Vol.19 PDL-41520

Toyama, Nobuo (Miyazaki. University)
ISOLATION AND PROPERTIES OF CELLULASE FROM TRICHODERMA KONINGI
Miyazaki, Japan. Univ. Fac. Agr. Memoirs 2:100-138 (1960)

Cellulase excreted by Trichoderma koningi could not be completely isolated from either a wheat bran-sawdust culture or a culture filtrate from a synthetic medium containing cotton as the sole carbon source. With both cultures, heat treatment for various periods at 40 C and low pH served to separate cellulase-xylanase from the other enzymes. Ethanol fractionation (after incubation at 40 C and pH 2.4) yielded a product consisting mainly of cellulase but with a trace of xylanase. Paper electrophoresis and ion exchange resin fractionation failed to separate the two completely. When the cellulase-xylanase isolates were heated 10 min at 70 C, both enzymes from the bran-sawdust culture were damaged, whereas both enzymes from the synthetic culture retained considerable activity.

Results of comparative tests of the relative activities of cellulase and xylanase in cellulase-xylanase isolates from various sources or in different ethanol fractions indicate that, although the two are similar in properties (as are cellulose and xylan), they are distinguishable. Both show substantial preference for random chain cleavage. Knowledge of the scission products of enzymic hydrolysis may explain the mechanism of degradation of cellulose and xylan.

Trichoderma, enzymes

1961 Biol 24
Vol.19 PDL-41662

Nicolson, T.H. (Minnesota. University. Dept. of Plant Pathology and Botany, St. Paul)
SURVIVAL, COLONIZATION AND ANTAGONISM OF INDUCED MUTANTS OF CHAETOMIUM GLOBOSUM KUNZE
Plant Disease Reptr. 44:774-777 (October 1960)

Fungi, Chaetomium, soil, mutants, biocoenosis

PDL-41325

Belser, William L. (Scripps Institution of Oceanography)
BIOASSAY OF ORGANIC MICRONUTRIENTS IN THE SEA
Natl. Acad. Sci. (U.S.) Proc. 45:1533-1542 (October 1959)

Tests, bioassay, sea water, nutrient

PDL-41660

Imshenetskii, A.A., L.I. Solntseva, and N.F. Kuranova
EXPERIMENTAL VARIATION IN ASPERGILLUS NIGER. I. MORPHOLOGICAL CHARACTERISTICS OF VARIANTS OBTAINED BY ULTRAVIOLET IRRADIATION
Microbiology 29:135-139 (September-October 1960)

Fungi, Aspergillus, ultraviolet, mutation, morphology

PDL-40775

Kriss, A.E., and E.M. Markianovich
UTILIZATION OF WATER HUMUS IN THE SEA BY MICROORGANISMS
Microbiology 28:376-381 (May/June 1959) (Translation of Mikrobiologiya. USSR)

Marine microorganisms, population, location, growth, reproduction

1961 Cer 11
Vol.19 PDL-41778

Rocla Pipes Ltd., Melbourne, Australia (by Wilhelm Seckin)
A PROCESS OF TREATING CONCRETE, DURING MIXING, TO INHIBIT RUST-FORMATION IN REINFORCEMENT OF THE FINISHED CONCRETE WORK
Commonwealth of Australia. Pat. Spec. 219,650; January 20, 1959. 4 p.

Ferrous reinforcement in concrete is protected against corrosion by adding to the cement mix 0.1 to 5% of a slurry of an aqueous suspension of a colloidal clay of the Wyoming Bentonite type and an insoluble or sparingly soluble chromium compound. A typical slurry comprises (in parts by wt) 35 zinc chromate, 7 Wyoming Bentonite and 58 water. Other suitable chromium compounds include the barium, strontium and lead salts, as well as chromium carbide, chromic fluoride and chromic oxide.

For additional protection, an aqueous emulsion containing 10 to 20% by wt of solid vinyl acetate polymer is added to the mixing water for the concrete in the proportion of 10 to 20% of the emulsion by weight of the cement.

Cement products, reinforcement, ferrous, corrosionproofer, chromium compounds, patent

PDL-41795

Arber, M.G., and H.E. Vivian (Australia. Commonwealth Scientific and Industrial Research Organization. Chemical Research Laboratories)
CARBONATION AS A MEANS OF INHIBITING SULPHATE ATTACK IN MORTAR AND CONCRETE
Australian J. Applied Sci. 12:330-338 (September 1961)

Compacted mortar specimens (water/cement ratio 0.5) and permeable mortar specimens (water/cement ratio 0.25) were subjected to sulfate attack by immersion in 10% ammonium sulfate solution after curing in moisture-saturated air at atmospheric temperature for 7 days. All

specimens expanded rapidly and disintegrated. Treating the moist-cured specimens with carbon dioxide significantly improved their resistance to sulfate attack; the increase was greater for permeable than for dense specimens. Undried mortars could not be carbonated sufficiently to prevent attack. An increase in the drying period before carbonation and a longer period of carbonation both increased resistance.

Heavily carbonated and uncarbonated specimens alike are susceptible to deterioration in low acid solution. For maximum benefit from the carbonation treatment, concrete products should therefore be exposed to neutral or alkaline salt solutions.

Heavy carbonation can protect mortar specimens from sulfate attack and disintegration even under severe exposure conditions for periods greater than 1 yr. Uncarbonated or inadequately carbonated mortars showed signs of distress and in many instances disintegrated. The improvement in sulfate resistance is obtained by formation of dense coatings of calcium carbonate on the exposed surfaces of cement gel which effectively insulate and protect susceptible cement clinker minerals, such as tricalcium aluminate hydrate, from reaction with sulfate.

Cement, cement products, decompositionproofing, sulfate, carbonation

PDL-39969

Grünzweig & Hartmann A.-G., Ludwigshafen/Rhein, Ger. (by Fritz Muthmann)
WEATHER-RESISTANT HIGHLY ELASTIC SILICATE FIBERS AND TWINES (in German)
Ger. Pat. 1,026,928; March 27, 1958. 2 p.

Highly elastic silicate fibers which are resistant to weathering and water are produced by a melt of the following composition (%): 40 to 65 silicon dioxide, 40 to 50 magnesia, 5 to 24 boric oxide, and 1.0 disodium plus dipotassium monoxides. The silicate melt can contain 0 to 10% boric oxide as a flux.

Fibers, ceramic, silicate, cordage, waterproof, elasticity, patent, foreign

Deterioration
NRC

1961
Vol.19

Fung 27
PDL-41262

Armour and Co., Chicago
IMPROVEMENTS IN OR RELATING TO PENTACHLOROPHENOL EMULSIFIABLE CONCENTRATES
Gt. Brit. Pat. Spec. 858,687; January 11, 1961. 3 p.

An emulsifiable pentachlorophenol(penta) concentrate that gives excellent flash dispersion on simple mixing with water to form a stable emulsion comprises: 5 to 20% by wt penta; 75 to 94% liquid aromatic hydrocarbon diluent; and as emulsifier, 1 to 5 (preferably 2 to 3%) disalicylate salts) of one or more specified organic compounds. Preferred diluents are xylene and Sovacide 544 C; alternatives include benzene and toluene. Claimed emulsifiers include N-tallow- and N-soya-N,N',N'-tris(2-hydroxyethyl)trimethylene -diamine disalicylate. The emulsifier is added to a prior solution of penta in the diluent. Such concentrates are available commercially as Santophen 20 and Dowicide 7.

Pentachlorophenol, aqueous, patent

PDL-41533

Martineau, B., and V. Fredette(Montreal. University)
A SIMPLIFIED METHOD FOR DETERMINING THE SENITIVITY OF ANAEROBIC BACTERIA TO ANTIBIOTICS
Can. J. Microbiol. 7:671-673 (August 1961)

Bacteria, antibiotics, toxics, tests

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Fung 28
PDL-41570

U.S. Dept. of the Air Force. Aeronautical Systems Division. Wright-Patterson Air Force Base (Gulf Research and Development Co. - Arthur V. Churchill and William W. Leathen)

ASD Technical Report 61-193 (June 1961) 66 p.

A total of 184 microorganisms were isolated from jet fuel-water bottom samples collected from storage tanks at nine Air Force bases. These isolates included 75 fungi, 104 bacteria, and 5 nonclassical iron-depositing bacteria; 61% of the total isolates remained viable for 20 days in jet fuel-mineral salts substrates. These may be considered to have the ability to attack the hydrocarbons and form sludge. The viable isolates appeared to fall into five fungal and three bacterial groups. The most predominant and durable fungal group were the brown fungi, with 87% surviving the 20 day viability test. Among the bacterial groups, the more homogeneous and transparent bacterial species predominated although the heterogeneous and opaque bacteria had the greatest survival rate.

Of 178 water-soluble materials evaluated as potential sludge inhibitors, alkyl quaternary ammonium acetate ($C_{17}H_{37}O_2N$), dimethylamine borane, and tri-n-butyl borate were effective microbicides and are recommended for trial in bulk storage tanks. Several other compounds controlled microbial growth satisfactorily, but are not recommended because of the presence of elements such as halogens or heavy metals potentially deleterious to fuel properties and fuel system materials.

A 90-day storage test showed that except for an increase in dielectric constant, microorganisms did not appreciably affect properties of jet fuel.

Fuel, jet, bacteria, fungi, toxics, tests

1961
Vol.19

Fung 29
PDL-38095

Moldtmann, Heinz G.
GAME REPELLENT FOR TREES AND SHRUBBERY AND METHOD OF PRODUCING THE SAME (in German)
Ger. Pat. 966,484; August 8, 1957. 2 p.

A repellent composition for inhibiting damage to forest trees by game is made by mixing, e.g., 40 to 50 (parts by wt) bituminous adhesive, 5 to 8 soaps or emulsifiers, homogenizing the mixture and adding to the resulting liquid with stirring 5 (parts by wt) 50% potassium hydroxide, 10 water, and 10 hexachlorocyclohexane. To this are added an additional 20 parts water, 5 to 7 parts hexachlorocyclohexane and a phenacyl compound to impact a repulsive sharp taste. The concentrate, diluted with water in a 1:9 ratio, is applied by spraying or painting. After evaporation of the water an insoluble coating is formed.

Trees, repellents, vertebrates, rodents, patent, foreign

PDL-41203

Whitney, W. Keith (Kansas State University)
FUMIGATION HAZARDS AS RELATED TO THE PHYSICAL, CHEMICAL, AND BIOLOGICAL PROPERTIES OF FUMIGANTS
Pest Control 29:16, 18-21 (July 1961)

Insect, toxics, fumigant, toxicology, review

PDL-41497

Gt. Brit. Forest Products Research Laboratory, Princes Risborough, Eng.
THE DEATH-WATCH BEETLE
Leaflet No. 4 (Rev.) (May 1959) 9 p.

Beetles, borers, wood, toxics, physiology

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Fung 30
PDL-41264

Shell Research Ltd., London (by Helen M. Higson)
NOVEL TRIAZINE DERIVATIVES, THEIR PREPARATION AND COMPOSITIONS CONTAINING THEM
Gt. Brit. Pat. Spec. 857,166: December 29, 1960. 6 p.

Wood, textiles, plants, seeds, and bulbs are protected from fungi by certain triazine derivatives obtained by reacting cyanuric chloride or bromide with specified dithiocarbamates, e.g., 1-methyl-, and 1,2-dimethylethylene bisdithiocarbamates or their alkali metal, alkaline earth metal, amine or ammonium salts.

The triazine derivatives are yellow, seemingly polymeric, and insoluble in all common solvents except pyridine. With or without emulsifying agents or surfactants, they are formulated (1) as dusts, using any of the common fillers; (2) with resinous or waxy carriers; (3) as aqueous or organic solutions or suspensions; or (3) as wettable powder concentrates for subsequent dilution with water. Dusts are applied at 1 to 10% by wt of the triazine derivative; liquid formulations, at 0.1 to 1.0%.

Fungi, toxics, textiles, wood, patent, triazine

PDL-41202

Hassler, Robert K.
HOW A MEASURING DEVICE MAKES FOR BETTER METHYL BROMIDE FUMIGATION
Pest Control 29:12, 14 (July 1961)

Insect, toxics, fumigants, methyl bromide, application, technique

1961 Fung 31
Vol.19 PDL-39968

Jenaer Glaswerk Schott & Gen., Mainz, Ger. (by Hubert Schröder)
OBJECTS MADE FROM GLASS (in German)
Ger. Pat. 1,032,899; June 26, 1958. 4 p.

Transparent objects such as glass or plastic containers, foils, and optical elements are protected from fungal attack by coating with a thin adherent layer of a carrier material free of turbidity; e.g., oxides, silicates, fluorides, and an inorganic fungicide, e.g., a copper or mercury salt. A suitable coating is precipitated from a solution of hydrolyzable silicic acid and titanic acid ester in the presence of a soluble copper compound, then heated to drive off the volatile components and form a hard oxide layer.

Coatings(inorganic), translucent, fungi, toxic, patent, foreign

PDL-41697

BIRD BATH CONTROL
Sci. News Letter 79:182 (March 1961)

Use of a bird birth control chemical is suggested as a means of eliminating birds that cause plane crashes over airports. Triethylenemelamine was effective in inhibiting for 2 mo the formation of gametes or reproductive cells in both male and female blackbirds and starlings. If the birds could be induced to eat corn treated with the chemical for three or four days at the right time of year, they would remain unproductive during the entire breeding season and thus for the whole year. In the first field trials, the fertility of blackbirds was reduced 20%. By placing treated feed in winter roosting quarters frequented only by blackbirds or starlings other birds would not be endangered.

Birds, biocontrol

1961
Vol.19

Fung 32
PDL-40083

Farbwerke Hoechst A.-G. vormals Meister Lucius & Brüning, Frankfurt, Ger. (by Helmut Klug and Fritz Herbold)
FUNGICIDAL IMPREGNANTS, STABLE TO LEACHING, FOR WOOD AND TEXTILES (in German)
Ger. Pat. 1,021,158; December 19, 1957. 3 p.

Fungicidal and insecticidal impregnants which cannot be readily leached out of wood or textiles, such as tarpaulins and tent fabrics, are salts of phenols or naphthols of low solubility and salts of halogenated carboxylic acids. If possible, the impregnated material is heated briefly at 70 to 130 C. Small wood parts are impregnated with a 2% solution of a mixture of 70% sodium pentachlorophenoxide and 30% sodium monochloracetate and a suitable water-soluble wetting agent, heated for a short time at 70 to 130 C and dried. Large wood parts are sprayed with a 5% solution of 58% sodium 2-naphtholate and 42% sodium monochloracetate and a wetting agent.

Wood, textiles, fungi, toxic, phenols, persistence, foreign, patent

PDL-41331

U.S. Dept. of Agriculture. Agricultural Stabilization and Conservation Service (Harold H. Shephard, John N. Mahan and Charlotte A. Graham)
THE PESTICIDE SITUATION FOR 1960-61
(July 1961) 22 p.

Annual report, insert, rodents, fungi, toxics, markets, review

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Lac 29
PDL-41188

Jedliński, Zbigniew, Zdzislaw Hippe, and Irena Kokot
EVALUATING METHOD FOR ANTICORROSIVE PROPERTIES OF COATINGS (in Polish with English summary)
Przemysl Chem. 39:443-446 (1960)

Water resistance of ship bottom coatings is evaluated by measuring changes in electric resistance of coated metal samples immersed in synthetic sea water for ≥ 120 hr. The measurements are made at regular time intervals using a 220 v current; a specially constructed electrode assures a constant surface area of contact with the coating of about 30 μ thickness under a constant pressure of about 50 kg sq cm. The method was applied to 18 coatings (most of them with a bitumen or coal-tar base). Among these, six were chosen for long-range field tests designed to check the accuracy of the laboratory method. Five were coatings having an infinite resistance after 120 hr immersion, one (coating 505) showed a considerable reduction of electric resistance after 24 hr. In field tests, steel plates with short copper rods welded to their surface were coated with the six compositions and immersed for 12 mo in sea water at a marine experiment station. The steel plates with copper rods when immersed in sea water constitute short-circuited galvanic cells, simulating conditions which prevail on the immersed surface of the ship in the vicinity of the driving turbine. The results of these tests were in full agreement with the laboratory evaluation: The steel plate coated with the 505 composition was badly corroded, whereas no corrosion occurred on plates protected with the high resistance coatings.

Coatings(organic), ships, tests, foreign

1961
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Lac 30
PDL-40084

Paton, Nancy, and L.J. Williamson
THE PERFORMANCE OF SOME AZO PIGMENTS IN AUSTRALIA
Paint Technol. 23:325-328 (December 1959)

Factors affecting the performance of azo pigment paints include the paint system itself, degree of reduction of the pigment with rutile titanium, exposure site, climatic conditions, and variation in pigment quality. In full shade colored pigment tests, paints were prepared with Paralac 10 as base alkyd. Tint shade paints were based on a rutile titania and medium/long oil length alkyd. Steel panels, primed with red lead, with two coats of white undercoat and two top coats of the test paint, were exposed on racks at a 45° facing north in New South Wales.

Toluidine Red and Permanent Red FRLL gave excellent results even when the paints were exposed to 2,260 hr of sunshine. All scarlet shades of azo pigments generally showed good performance. Of a similar order but not quite so good is Permanent Red R. Para Chloro Red is similar to Toluidine Red. The deeper reds show a relatively poor performance. Para Red shows good color retention but rapidly breaks up the film. Permanent Carmine shows rapid loss of gloss and darkening of shade. Subsequent exposures of Permanent Red F4RH gave much better results although the fastness in reduced shade is not up to requirements of a first class finish. Benzidine Yellow is unsuited for exterior exposure in tints under Australian conditions. Hansa Yellow, when supported with Ferrite Yellow, has sufficiently good color retention for most purposes. With rutile titania, it is nearly equal to Green Gold under severe climatic conditions.

In assessment of tint shades, quality, type and source of rutile titania is important. Chalking can be severe with an adverse combination of factors.

Coatings(organic), exterior, pigments, azo compounds

1961 Lac 31
Vol.19 PDL-38989

A NEW LACQUER PIGMENT FOR THE FORMATION OF ELECTRICALLY CONDUCTING COATINGS ON PLASTIC SURFACES (in German with English translation)
Kunststoffe 50:478-479 (August 1960)

A metallic pigment ("Kontaktargan"), less expensive than silver and with better adhesion than graphite, produces electrically conducting lacquers and conductive layers on plastic surfaces. The particles which are scaly and similar in appearance to the coarser grades of bronze powder may be incorporated in any binder of sufficient strength. With a lacquer containing 20% "Kontaktargan," resistance values of 0.5 ohm are obtained; the pigment surfaces do not oxidize and metallic conductivity is maintained even under severe conditions. Application includes coatings with a screening effect such as that of the Faraday screen, adhesives and cements capable of conducting electric currents, special purpose paints for elimination of static electricity and protection against radiation interference, tank linings and groundwater protection in buildings. Tests under a variety of conditions confirmed the excellent conductivity of the coatings and their resistance to aging.

Coatings(organic), pigment, conductivity, polymers, foreign

PDL-39574

Metalalinstituut T.N.O., Delft, Neth. (J.S. Boon)
COMBATING CORROSION ON SHIP HULLS THROUGH CATHODIC PROTECTION INFLUENCE ON PAINT SYSTEMS (in Dutch)
Publication 75 (June 1960) 11 p.

Ship, corrosion, cathodic protection, coatings(organic), foreign

1961 Lac 32
Vol.19 PDL-39373

Schering A.-G., Berlin, Ger. (by Heinz W. Sparmann)
ADDITION TO UNDERWATER COATINGS AND BUILDING MATERIALS TO PREVENT DAMAGING GROWTHS (in German)
Ger. Pat. 1,042,795; November 6, 1958. 2 p.

Ship's bottoms and other submerged objects are protected from growth of marine plants and animals by using triphenyltin chloride as a paint additive. Effective additions range from 2 to 12%, based on the total paint, or 4 to 24% based on paint solids. In tests carried out in the North Sea, paint layers with 18% triphenyltin chloride (by wt solids) remained free of growth for 11 mo.

Coatings(organic), foulers, toxic, tin compounds(organic), patent, foreign

PDL-37000

Garmsen, Werner, and Irmgard Kajüter
ANALYTICAL METHOD FOR THE DETERMINATION OF CHALKING ON WEATHERED PANELS (in German)
Farbe u. Lack 65:373-375 (July 1959)

Coatings(organic), chalking, measurement, foreign

1961
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Met 65
PDL-40632

Wróblewska, Zofia
RAPID LABORATORY METHOD FOR THE EVALUATION OF THE EFFICIENCY OF CORROSION INHIBITORS SOLUBLE IN MINERAL OILS (in Polish)
Gaz, Woda i Tech. Sanit. 33:452-454 (1959)

A number of polar corrosion inhibitors soluble in mineral oil were tested by the "drop method," developed by Greco and Spalding. The method essentially consists in determining the shape (ratio of thickness to diameter) of a drop of oil containing the inhibitor on the surface of the metal. A low ratio indicates good wetting ability. The compounds tested included salts of sulfanilic, benzenesulfonic and anthranilic acids, and several amines. Good results (reduction of drop size from 2 to 0.5 to 0.25) were obtained for ammonium benzenesulfonate, calcium sulfanilate, diphenylamine, and diaminoanthraquinone. The quantities of the inhibitors added to oil ranged from 0.01 to 0.05%. The mechanism of action of polar corrosion inhibitors is discussed briefly.

Oils, corrosionproofers, test, foreign

PDL-37365

Clark, Warren O.
BASIC REQUIREMENTS OF CORROSION CONTROL
Corrosion Technol. 7:114-117 (April 1960)

Given competent design and initial setting, available impressed-current systems with automatic controls are efficient, trouble-free and practical preventatives of marine corrosion. High speed ships need a special type of flush-mounted lead-platinum anode; all components of this system are encapsulated and require no maintenance or replacement. For other vessels and fixed structures, zinc anodes are preferred. Although more bulky and sacrificial, they are cheaper and require 90% less power than the lead-

platinum. Their depletion rate can be calculated precisely. In neither system is location or spacing of anodes critical.

Ships, cathodic protection

PDL-39375

Goldschmidt (Th.) A.-G., Essen, Ger. (by Ludwig Havestadt)
CORROSION INHIBITORS FOR IRON TUBES OR VESSELS
Ger. Pat. 1,022,861; January 16, 1958. 2 p.

Bacterial attack on bituminous coatings of pipe and tanks for feed water, waste water, or sludge and septic slime is inhibited by adding to the bituminous mass 0.01 to 1.0% high-molecular amines containing $\geq$ 1 nitrogen atoms, $\geq$1 long-chain alkyl group with $\geq$ 8 carbons, and optionally other groups. Suitable bactericidal amines include octyl-, dodecyl-, didecyl-, diethylhexadecyl-, hexadecylammoniumethyl- and hexadecyloxyethyl-, and palmitoylamidoethyldimethylamine, octadecyltrimethylammonium hydroxide, and hexadecylaminopropylglycine and their salts.

Coatings(organic), bitumens, bacteria, toxic, patent, foreign

PDL-40823

Jacopetti, Mario M.
CATHODIC PROTECTION OF INSTALLATIONS EMBEDDED IN THE SOIL OR IMMERSED IN WATER (in German with English summary)
Werkstoffe u. Korrosion 12:280-288 (May 1961)

Metal, structures, soil, water, cathodic protection, foreign

1961 Met 67
Vol.19 PDL-37231

Phelps, E.H., and A.W. Loginow (United States Steel Corp. Applied Research Laboratory, Monroeville, Pa.)
STRESS CORROSION OF STEELS FOR AIRCRAFT AND MISSILES
Corrosion 16:97-107 (July 1960)

Alloy and stainless steels heat treated to very high strength may be susceptible to atmospheric stress corrosion in the severely corrosive environments at Kure Beach, N.C. and also in the moderately corrosive semi-industrial environment of Monroeville, Pa.

Cold worked and stress relieved austenitic stainless steels with very high yield and tensile strengths were resistant at Kure Beach. The semi-austenitic precipitation-hardenable stainless steels were resistant at Monroeville. Generally, the time to failure for the susceptible steels increased when the stress level decreased from 90% to 50% of the yield strength. Yield and tensile strengths of several steels were not affected by corrosion during 6 mo at Kure Beach. Ductility of steels containing 12% chromium or less was decreased by this exposure.

An alloy steel and a 12% chromium martensitic stainless steel were not susceptible to stress corrosion when tempered at 1100 to 1200 F. Hot worked die steels tempered at 1100 F had greater stress corrosion resistance than when tempered at 1000 F. Environment is one of the controlling factors in failures in 12% chromium martensitic stainless; anions other than chloride can cause cracking. Stress corrosion of this steel results from corrosion along an active path in the metal and not from hydrogen induced in the metal by corrosion.

A correlation between specimen tests and service performance was not established. It is pointed out that in aircraft and missile applications incidental environments, factory, test or storage atmospheres may be deleterious as the operational environment. It is net tensile stress, residual and applied, that affects stress corrosion. In special environments stress corrosion cracking can be prevented by certain protective coatings.

Steel, stainless, stress, corrosion
Deterioration
NRC

1961
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Met 68
PDL-40622

Westinghouse Electric Corp., Pittsburgh, Pa.
(D. van Rooyon)

STRESS CORROSION CRACKING. SOME ASPECTS OF STRESS CORROSION CRACKING IN AUSTENITIC STAINLESS STEELS

Technical Report 3 (August 1960) 44 p.

Addition of small amounts of nitrogen or larger amounts of molybdenum reduces resistance of austenitic stainless steels to transgranular stress corrosion cracking. Increasing the carbon or nickel content, and perhaps tin to some extent, increases cracking resistance. Variations in time to failure result from differences in the reaction time preceding crack propagation , while rate of crack penetration remains approximately constant.

Test results with composite specimens made by bonding the test alloys to a susceptible commercial steel show good correlation between times to failure of the experimental alloys when tested alone, and the number of propagating cracks which will penetrate into them. Crack initiation may consist of a form of corrosion attack which is required to expose a path of rapid corrosion, after which true cracking proceeds.

Potential measurements indicate that strain-induced anodic depolarization cannot account for cracking entirely by an electrochemical mechanism. An electrochemical mechanism wherein reaction takes place at sites of structural and composition changes in the steels is preferred; these may be formed under the influence of stress, setting up paths of easy localized corrosion.

Stainless, stress, corrosion, alloying agents, mechanism

1961 Met 69
Vol.19 PDL-38205

Hunter, A.D., and C.H. Horton (Hinchman Corp., Detroit, Michigan)
CATHODIC PROTECTION CHECKS CORROSION
Underwater Eng. 1(3):40-41 (November 1960)

Cathodic protection systems used on two "Texas Towers" supporting ACW radar stations off the Atlantic Coast are described. Tower No. 2 stands in 50 ft of water with a tide range of ± 3 ft, its caissons jetted 50 ft into hard sand. From 13 ft below mean water to 22 ft above, the caissons (first freed of mill scale) are sheathed in Monel; the rest of the caisson surfaces are coated with bitumastic estimated to last less than 3 yr. The anode, an 18-in. cast steel sphere suspended by a single, winch-wound cable, consumes 90 amp at 12 v dc. The anode lasts over 1 yr; when reduced to a 6-8 in. diameter, it is cut from the cable and a new sphere attached.

The design of Tower #4, with bracing between the legs, precludes use of one central anode. Three "anode beds" are installed on the ocean floor at a depth of 180 ft and away from the tower. The high silicon cast iron anodes, 3 in. in diameter and 60 ft long, consume 175 amp. No other details are given. After 2 yr the structure is in excellent condition. Tower #4 also has (unspecified) cathodic protection of the interiors of its three caissons which sometimes contain sea water, sometimes diesel oil.

Marine, structures, cathodic protection

PDL-41247

Sharpley, J. Miles (Buckman Laboratories, Inc.)
MICROBIOLOGICAL CORROSION IN WATERFLOODS
Corrosion 17:92-96 (August 1961)

Bacteria, sulfur, iron, corrosion, pitting, metals, oil wells

1961 Met 70
Vol.19 PDL-41705

Stumm, Werner (Harvard University, Cambridge, Mass.)
INVESTIGATION ON THE CORROSIVE BEHAVIOR OF WATERS
Proc. Am. Soc. Civil Engrs. 86(SA-6):27-45 (November 1960)

In the early phases of corrosion of cast iron in aerated waters the electrode process is under cathodic control. After prolonged exposure, the anodic rate codetermines to a marked extent the overall corrosion rate.

In waters of high buffer capacity, more homogeneous and more protective coatings are formed than in waters of low buffer capacity. Buffering constituents (carbonate and bicarbonate ions) enhance the passivating properties of dissolved oxygen and thus indirectly retard the anodic reaction rate by formation of strongly inhibitive anodic oxide films.

Corrosion rates tend to increase with increased pH from 6.9 to 8.6 (the range of natural waters). Variations of corrosion rates with pH can, at least partly, be explained by the change in buffer capacity associated with a change in hydrogen ion concentration. Furthermore, the pH has a marked effect on the cathode-anode area distribution. The size of the local anodes increases with increased pH.

Deposition of calcium carbonate reduces the anode area fraction. Deposition is primarily controlled by electrochemical changes at the metal surface and is dependent also on buffer capacity and flow rate of the solution. Conditions for clogging anodic pores are more favorable at a pH 7 than at higher values.

Iron, forms, corrosion, water, pH, hardness

1961 Met 71
Vol.19 PDL-41517

AUTOMATIC IMPRESSED-CURRENT, SACRIFICIAL, AND COMBINED CATHODIC PROTECTION SYSTEMS. PROTECTION FOR STEEL PROPELLERS
Corrosion Technol. 8:250-252 (August 1961)

Three systems are described, all of which provide complete underwater corrosion protection for the largest and smallest vessels with any steelwork under water.

The Readermatic system, designed primarily for large ships, is fully automatic and is made up of prefabricated enobled lead alloy anodes and zinc reference alloys. Both are mounted on the hull along with a control unit. A unique analogue compensator permits rapid cathodic protection current response to changes in hull conditions and prevents overprotection that might occur, for example, in fresh water harbors.

Readermajor is a simpler system for smaller ships where a high degree of stability and accuracy is not essential. A combination of sacrificial anodes and impressed current gives a simple two-position control by switching on and off the impressed current as the ship leaves or enters a harbor. The impressed current can be set by manual control to provide the correct hull potential as displayed on the controller.

The Readerminor system protects small boats at sea and in harbor. A two-level current operates on a low voltage electric system. It can be used to prevent rudder and propeller corrosion in wood boats and keel, and rudder and propeller corrosion of yachts.

Ships, cathodic protection

PDL-41537

Logan, Hugh L.
STRESS-CORROSION CRACKING OF THE AZ31B MAGNESIUM ALLOY
J. Research Natl. Bur. Standards 65C:165-169 (July/September 1961)

Magnesium alloys, corrosion, stress, mechanism

1961
Vol.19

Met 72
PDL-41543

Stoffels, Hans and Wilhelm Schwenk
INVESTIGATION OF PIT CORROSION ON CHEMICALLY RESISTANT STEELS WITH THE AID OF TURNBULL'S BLUE COLOR REACTION (in German with English summary)
Werkstoffe u. Korrosion 12:493-500 (August 1961)

Pit corrosion in chloride containing solutions was investigated by means of Turnbull's blue. The reagent gives rise to a test potential which coincides with the redox potential of aerated neutral solutions and to a color indication of pit appearance. With the indicator, the relative position of pit corrosion potential and test potential, as well as the induction time, can be determined. Pit density is not a criterion.

Resistance diagrams for ten different chemically resistant steels are plotted as a function of the chloride ion and inhibitor concentration. The inhibitors include sodium nitrate, soda liquor and a pyridine phosphate. The induction time chloride ion concentration curve indicates a linear-reciprocal relationship similar to pure iron. This relationship is used for examining the influence of different types of preliminary treatments of the sample and the effect of nitric acid passivation.

Corrosion, pitting, steel, test, indicator

PDL-41506

U.S. Wright Air Development Division (Michigan. University - D.R. Jenkins, H.E. Gascoigne, L.W. Wolf, and S.K. Clark)
EFFECT OF STATE OF STRESS ON THE FAILURE OF METALS AT VARIOUS TEMPERATURES
Technical Report 60-234....ASTIA Doc. 245245 (July 1960) 27 p.

Metals, stress, failure, cracking, brittleness, temperatures, theory, test equipment, tests

1961 Met 73
Vol.19 PDL-41467

Sinclaire, Morgan, and Eugene Phillips (Douglas Aircraft Co., Inc. Aerophysics Laboratory and Development Testing, El Segundo, Calif.)
WHY DOES STAINLESS STEEL CORRODE?
Metal Progress 80:92-96 (September 1961)

Sensitization of austenitic stainless steels heated in the range 900 to 1400 F results in intergranular corrosion. Chromium carbides are precipitated at the grain boundaries, leading to a difference of potential between the center of the grains and their outer chromium-depleted zones. Even if sensitization is minimized by limiting the amount of carbon or by adding stabilizing elements such as titanium, columbium or tantalum, the carbon content of the steel will be raised in carburizing environments such as natural gas, carbonaceous furnace atmospheres, rich oxyacetylene flames, and the carburized surface will be subject to the same chromium-carbide precipitation.

Corrosion also results from chlorine containing materials entrapped in crevices. Trichloroethylene used as a degreasing agent slowly liberated hydrochloric acid when contaminated with water, the reaction being catalyzed by iron and accelerated by rise in temperature. Other common potential corrodents are vinyl chloride plastics, chlorinated lubricants, and plastics catalyzed with hydrochloric acid.

Passive stainless steel possesses a submicroscopic oxide film (formed in air or other oxidizing medium such as aerated water or nitric acid) on its surface to resist corrosion. Active stainless does not. The potential difference between the two types is 0.5 to 0.6 v. Thus, if a passive surface is interrupted by an active area, corrosion will occur when an electrolyte is present. Corrosion is often initiated by an oxygen-concentration cell. Crevices or covered surfaces starved of oxygen with an electrolyte entrapped will become anodic to the surrounding uncovered, high-oxygen area. The ensuing corrosion at the anode area destroys the passive film to form an active area, consequently creating a destructive cell. Thus, salt crystals under humid conditions will

provide a good electrolyte and initiate active sites; also, sand or metal particles deposited on the surface will cause pitting damage under saline humid conditions.

Prevention of corrosion should, therefore, include: passivating and cleaning the surfaces, eliminating moisture traps, removing manufacturing debris and chlorinated solvents, avoiding carburization, and keeping the operating temperature below 800 F for unstabled stainless.

Stainless, corrosion, mechanism

PDL-41110

Rudzskii, Z.I., and A.A. Spirin
CORROSION OF ALUMINUM-SHEATHED POWER CABLES IN REFINERIES (in Russian)
Azerbaidzhan. Neftianoe Khozi. 39:40-41 (February 1960)

Failures of aluminum sheaths on underground cable occurred most frequently near lead sleeve joints. Usually, the aluminum sheaths, stripped over a certain length of the insulating jacket, were deeply corroded. Since galvanic corrosion at the junction of two metals surrounded by soil appeared to be the cause of deterioration, measurements of potentials and current densities were made along an uncovered length of cable which had been repaired. The high corrosivity of the soil in which the cable was buried was shown by a pH of 8.31, 6-10% moisture and 19.27% organic substances. The highest potential and the highest current density were found at the points of contact of the two metals and along the stripped lengths of the sheath. At a current density of 6.7 ma/sq dm, the aluminum sheath deteriorated within 6 to 8 mo. Wrapping aluminum sheaths in plastic tape, and protecting lead sleeves with anticorrosive coatings prevented such deterioration.

Cable, aluminum, sheath, underground, corrosion

1961 Met 75
Vol.19 PDL-41444

U.S. Atomic Energy Commission. Translation of report by V.V. Andreyeva et al. in Russian book "Alloys of Rare Metals," Moscow 1960.
CORROSION RESISTANCE OF ZIRCONIUM AND ITS ALLOYS
AEC-tr. 4345

The effect on mechanical properties and resistance to acids of alloying zirconium with niobium, molybdenum, tantalum, tin and titanium was determined. Acid resistance tests were carried out in different concentrations of hydrochloric, sulfuric, phosphoric and nitric acids at 100 C for up to 100 hr.

All alloying elements increased the strength and decreased the plasticity of iodide zirconium. Niobium increased the plasticity of technical zirconium. Ultimate strength of alloys of iodide zirconium alloys was higher than in unalloyed metal after corresponding thermal treatment by as much as 19-26 kg sq/mm. At the same time elongation and contraction values decreased less than 6%. It was established that limits of the resistant state of the investigated alloys are dependent on the concentration of acids. Alloying of zirconium increased its corrosion resistance to media in which an unalloyed metal is unstable, e.g., 80% sulfuric acid.

Zirconium, zirconium alloys, mechanical properties, corrosion, acids

PDL-41780

U.S. Wright Air Development Division (Battelle Memorial Institute - Alexander A. Mittenbergs, Dean N. Williams, Robert I. Jaffee and Horace J. Grover)
INVESTIGATION OF THE FATIGUE PROPERTIES OF MOLYBDENUM UNDER VARIOUS CONDITIONS OF TEMPERATURE, COATINGS, AND STRESS CONCENTRATION
Technical Report 60-427;...ASTIA Doc. 249770 (October 1960) 130 p.

Molybdenum, fatigue, coatings(metallic), temperature, mechanical properties

Deterioration
NRC

1961
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Met 76
PDL-41623

Sereda, P.J. (National Research Council, Canada. Division of Building Research)

CHARACTERISTICS OF MOISTURE DEPOSITION ON CORROSION SPECIMENS

Materials Research and Standards 1:719-723 (September 1961)

Time-lapse photography was used to record the appearance of rain and dew on the surface of metal specimens of various thickness and grains over a 2-mo period of 350-hr total wetness. Specimen temperatures also were recorded during wet periods.

Moisture deposits show wide variations ranging from droplets to films, with no single state representing the physical character of the surface moisture during any period of wetness. The nature of the deposit is influenced not only by atmospheric conditions and the type of surface but also may change through repetitive cycles during any one atmospheric situation.

Both dew and rain settle on clean metallic surfaces as evenly distributed droplets, with the largest (not greater than 1/8 in. in diameter) formed on galvanized steel. Moisture deposited on corroded metal specimens from rain or dew is different in character from that on uncorroded metal or where corrosion products represent a hard smooth surface as on copper.

The average temperature of the specimens during the time of wetness is less than 1 F below the air temperature; during rainfall, it is the same as that of the air. At the time dew forms or at the time the sun begins to shine on the specimens, temperature variation may be larger but these conditions are transitory. When dry, the specimens are 2 to 5 F different from the air. Thickness has slight effect on the average temperature of clean specimens.

Metals, corrosion, water, deposits, dew, rain

1961 Met 77
Vol.19 PDL-37873

Southwell, C.R., B.W. Forgeson and A.L. Alexander (U.S. Naval Research Laboratory)

CORROSION OF METALS IN TROPICAL ENVIRONMENTS. PART 4. WROUGHT IRON

Corrosion 16:120-126 (October 1960)

The corrosion of Aston process wrought iron alone and galvanically coupled with mild structural steel was studied over an 8 yr period in five Panama Canal environments: continuous sea water immersion, mean tide immersion, continuous fresh water immersion, marine atmosphere and inland atmosphere. Comparison data on several structural steels exposed under the same conditions are given.

Continuous sea water immersion corroded wrought iron most heavily; weight losses in continuous fresh water and mean tide were approximately equal. Mean tide produced lowest pitting penetration. Slopes of curves at 8 yr exposure suggest greater divergence with increasing exposure time. Comparison of wrought iron and mild structural steel after 4 yr in continuous sea and fresh water showed practically no difference in the metals. After 8 yr, however, the wrought iron loss was significantly less than that of steel. At mean tide the wrought iron showed less corrosion damage at all periods of exposure. Even greater differences, in favor of the wrought iron, are probable for longer exposure periods.

Coupling tests showed that wrought iron is anodic to the steel in both sea and fresh waters. However, a quantitatively significant galvanic corrosion of wrought iron occurred only for the continuous sea water immersion. Protection of steel by wrought iron requies a large area of the iron in relation to the steel, and under these conditions the corrosion of steel is reduced by approximately one half.

Millscale accelerates pitting only in continuous sea water. It was less harmful on wrought iron than on steel.

After 8 yr in the marine atmosphere weight loss of wrought iron was 1.6 times greater than in the inland atmosphere. In both marine and inland atmosphere 8 yr weight losses of wrought iron were more than double that of any of four low alloy structural steels.

Iron, forms, steel, corrosion, sea water, atmosphere, marine, hot
Deterioration
NRC

1961 Met 78
Vol.19 PDL-38005

Forgeson, B.W., C.R. Southwell, and A.L. Alexander (U.S. Naval Research Laboratory)
CORROSION OF METALS IN TROPICAL ENVIRONMENTS. PART 5. STAINLESS STEELS
Report 5517 (September 1960) 20 p.

Over a period of 8 yr, six stainless steels (AISI No. 410, 430, 301, 302, 316, 321) were exposed to underwater and atmospheric environments in the Panama Canal Zone. In sea water, stainless steels were inferior to phosphor bronze and to structural steels. They were severely pitted during sea water immersion; mean tide produced one fourth to one tenth the pitting of continous immersion. The greater pitting attack in tropical than in temperate areas may result from heavy marine fouling. These steels are not recommended for sea water service where perforation of structure is a consideration. When submerged in fresh water, stainless steels were practically unattacked. They were superior to ordinary steels and equal to phosphor bronze. Tropical atmospheres appear to be no more corrosive to stainless steel than temperate climates; the marine were slightly greater than the inland effects. However, precautions should be taken to eliminate cracks where passivity-destroying agents could accelerate pitting attack.

Steel, stainless, bronze, corrosion, sea water, water, atmosphere, hot, marine

PDL-41784

Canada. Defence Research Board. Armament Research and Development Establishment. Quebec (H.P. Tardif and H. Marquis)

HIGH PRESSURE HYDROGEN EFFECTS ON STEEL
CARDE Technical Memorandum 609/61 (May 1961) 28 p.

Steel, embrittlement, hydrogen

1961 Met 79
Vol.19 PDL-39084

Krulfeld, M., and M.C. Bloom (U.S. Naval Research Laboratory. Metallurgy Division)
CORROSION MECHANISMS (PROTECTIVE SPINEL FILMS ON STEEL-THEIR STABILIZATION TO DETERIORATION ON ROOM TEMPERATURE EXPOSURE TO AQUEOUS MEDIA)
Report of NRL Progress (September 1960) p. 42-44.

An attempt was made to improve the room temperature stability in aerated water of protective spinel films formed by reaction of water with steel at 600 F. Mild steel strip specimens were exposed to various aqueous media for 4 to 5 wk in autoclaves maintained at 600 F. Media included distilled water and solutions containing 0.01 gram-atoms of substituent cations per liter, the solutes being NaOH, LiOH, $Al_2(SO_4)_3$, $MgSO_4$, $ZnSO_4$, $CuSO_4$ and $Ca(NO_3)_2$. After rinsing and drying, the spinel-filmed specimens were immersed in room temperature air-saturated distilled water for 2 wk and their behavior observed. Films formed at 600 F in the Li and Cu solutions have far greater resistance than films similarly formed in distilled water. Films formed in Al, Na, Mg, and Zn solutions are no better than the distilled water product. The Ca solution film appears intermediate in stability between the other two groups. Increase of Al concentration to 0.1 molar promotes stability of the resultant film. These results are not completely reproducible and must be considered tentative.

Steel, oxide, coatings, high temperature, corrosion-proofer, water, pressure

PDL-40814

Gabor, T. (Westinghouse Electric Corp., Pittsburgh, Pa.)
ANODIC OXIDATION OF GERMANIUM
J. Applied Physics 32:1361-1363 (July 1961)

Germanium, anodes, oxidation

1961 Met 80
Vol.19 PDL-38906

Fenn, R.W., Jr., and L.F. Lockwood (Dow Metals Products Co., Midland, Mich.)
LOW-TEMPERATURE PROPERTIES OF WELDED MAGNESIUM ALLOYS
Welding J. Research Supplement 39:352-s-356-s (August 1960)

A weld-test program was conducted at room and low temperatures on AZ31B, HK31A, HM21A, ZE10A and ZE41XA magnesium sheet and plate and AZ61A and EZ33A filler rods. Tensile strength and elongation data are given for unwelded and welded sheet and the metals at 75, -109, and -321 F.

In general, the strengths of both base metal and welds gradually increase with decreasing test temperature. The magnitude of the increase is greater for the base metals than for the welds. Ductilities of the base metals and welds gradually decrease with reduction in test temperature. A similar increase in strength and decrease in ductility occurs in filler rod metals at low temperature. Maximum base metal and weld strengths at low temperature are obtained on AZ31B base metal welded with AZ61A filler rod. Metal temper or sheet thickness do not affect the net change in properties resulting from decrease in test temperature.

Magnesium alloys, welds, mechanical properties, low temperature

PDL-41540

IMPROVED CORROSION RESISTANCE FOR CARS USING GALVANIZED STRIP
Corrosion Technol. 8:246-248 (August 1961)

Steel, coatings(metallic), zinc, corrosionproof, automobile

1961 Met 81
Vol.19 PDL-37586

Craig, H. Lee, Jr., and Patrick H. Woods (Reynolds Metal Co.)

INHIBITION OF CORROSION OF THE HYPEREUTECTIC ALUMINUM-SILICON ALLOYS IN ANTIFREEZE SOLUTIONS

Corrosion 16:129-132 (September 1960)

Laboratory tests of several inhibitors in a simulated automobile-engine cooling system show that corrosion of hypereutectic aluminum alloys, even in galvanic couples with copper, may be reduced to negligible amounts. For example, a single-phase organic phosphorous compound reduced corrosion from approximately 70 to 3 mdd. Pitting corrosion, found only in stagnant solution tests, can also be inhibited.

The aluminum test specimens were prepared from four cast 15% by wt silicon alloys A, B, C and D containing, respectively, 0.35, 0.55, 1.07 and 5.01% copper. Iron specimens were of a grey cast typical of engine blocks. The test pieces were made in the form of 0.5-in. OD cylinders 1 in. long, and drilled through their longer axes to enable threading on nylon rods. Copper specimens (99.9% purity) were of soft-temper type 1 tubing. The threaded test pieces were separated by polyethylene washers: for galvanic tests, alloy cylinders were threaded alternately with copper or iron.

In one test series the rods were rotated at 230 rpm for from 3 to 36 days in 160 F synthetic Altoona, Pa., tap water (acidic) with various glycol contents. Ratio of solution volume to specimen area was 20 cu cm/sq in. Rods also were suspended in a 2-in. diameter plastic tube through which solutions maintained at 160 F were pumped. Degree of corrosion in terms of weight loss was determined periodically by acid cleaning and weighing. Comparative tests were run of each of the four alloys freely corroding, coupled with copper and coupled with iron.

Coupling with either copper or iron increased the susceptibility of all four alloys, of which alloy C was the most resistant. Either freely corroding or coupled with copper, cast iron corroded faster than did the alloys: aluminum rates ranged up to 76.4 mdd over periods

up to 36 days, whereas iron lost 436 mdd in 7-day tests. Acidic hard tap water was more corrosive than neutral hard tap water. Ethylene glycol reduced corrosion less than methyl alcohol in an uninhibited anti-freeze mixture. A higher ratio of solution to surface increased the corrosion rate, whereas variation in circulation speed affected corrosion only slightly. With constant stirring at 160 F, no difference in corrosion rate was noted between machined and as-cast surfaces.

Aluminum alloys, ferrous, copper, corrosion, coupling, glycols, antifreeze, corrosionproofer

PDL-39404

Obrecht, Malvern F., and Laurence L. Quill (Michigan State University, East Lansing)
HOW TEMPERATURE, TREATMENT, AND VELOCITY OF POTABLE WATER AFFECT CORROSION OF COPPER AND ITS ALLOYS. TESTS SHOW EFFECTS OF WATER QUALITY AT VARIOUS TEMPERATURES, VELOCITIES
Heating, Piping, Air Conditioning 32:105-113 (May 1960)

Copper tubing was exposed to sodium zeolite softened water and blended water of 60 and 110 ppm hardness. Water velocities were varied from 1.5 to 13.1 fps and temperatures from 50 to 200 F. Samples were exposed for 17 mo with regular 4-mo inspections.

Maximum corrosion for a given velocity does not occur at the highest temperature, but rather about 170 F. Of the three types of water, corrosion is least noticeable with sodium zeolite softened water blended back to 110 ppm. The amount of corrosion increases with velocity increase. In general, corrosion rates are not excessive if velocities are below 5 fps. Corrosion-erosion appears to be the net result of temperature and velocity as well as softening or blending.

Copper, pipe, corrosion, water, velocity, hardness, temperature

Deterioration
NRC

1961 Met 83
Vol.19 PDL-40724

Klark, G.B., M.I. Mikailovskaya, Yu. N. Mikhailovskii, and N.D. Tomashov
AN ELECTROCHEMICAL METHOD FOR THE INVESTIGATION OF THE ATMOSPHERIC CORROSION OF METALS (in Russian)
Akad. Nauk SSSR. Inst. Fiz. Khim. Trudy. Issledovaniia po Korroziimetallov 5(7):11-21 (1959)

A method permitting study of electrode processes underneath a thin adsorption film of moisture is based on the following considerations: if a metal electrode is reinforced with an insulator capable of adsorbing moisture, then the moisture film formed on the surface of the insulator will be uniform, and not subject to rupture. When a half-cell is placed on the insulator, the metal, the moisture film, and the half-cell form a closed circuit which, despite the high electric resistance, makes it possible to measure the potential of the metal underneath the adsorption film. Two arrangements are possible: the potential can be measured with respect to reference half-cells located outside or in the electric field. A cell of the first type essentially consists of two metal foil electrodes placed between thin plates of a (glass or mica) dielectric. The reference electrodes are placed on strips of moist filter paper which are in contact with the moisture films on the dielectric plates. Because of the high resistance of the moisture film, a drop of potentials across the electrodes occurs, so that the potential, which is measured on the external surface of the metal foil, can differ from that on the internal surface. Thus, the potentials measured are only relative.

To measure the potentials in the zone of maximum polarization, i.e., on the internal surface of the metal, a different type of cell was constructed, with the reference electrodes located in the electric field. In this cell, the metal electrodes are separated by three glass plates of equal thickness. The central plate is separated from the other two by sheets of filter paper, impregnated with a dilute solution of potassium carbonate or calcium nitrate, and dried.

These paper sheets are in contact with the reference electrodes which are located each at one third of the distance between the metal electrodes. The potential drop between the two reference electrodes is equal to one third of the total potential drop between the anode and the cathode. This value is used to calculate the true potentials of cathode and anode from the experimental data. The whole cell, whether of the first or second type, is placed in an airtight chamber with controlled temperature and humidity. If desired, the moist air can be replaced by air polluted with corrosive gases. For measurements of potentials and current intensity, high precision voltmeters and ammeters are used.

The cells are suitable for the study of the cathodic and anodic behavior of a metal underneath a moisture film, when subjected to a polarization current, or for study of corrosion currents of a pair of different metals. Experimental data are presented for copper and zinc electrodes in moist atmosphere (75 and 100% RH), unpolluted and polluted with 0.01-0.1% sulfur dioxide. These data show that the corrosion currents are affected by the relative humidity of the atmosphere, by the presence of a corrosive pollutant and by its concentration.

Corrosion, metals, atmosphere, contaminants, test, foreign

PDL-40529

Pennsylvania. University. Department of Chemistry
(J.O'M. Bockris and M.A.V. Devanathan)
THE DETERMINATION OF THE COVERAGE ON NICKEL AND STEEL DURING ELECTROLYTIC HYDROGEN EVOLUTION
Technical Report 4 (February 1961) 51 p.

Nickel, steel, cathodes,hydrogen, analysis

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Met 85
PDL-41718

Imperial Chemical Industries Ltd., London (by Harry Clough)
IMPROVEMENTS IN AND RELATING TO AQUEOUS COMPOSITIONS HAVING DIMINISHED CORROSIVE PROPERTIES
Gt. Brit. Pat. Spec. 849,126; September 21, 1960. 5 p.

Corrosion by sea water used as ballast in oil tankers is minimized by adding 1 to 500 ppm of a compound having the structure $RX(CR'R'')_nCOOY$ where R is alkyl, aryl, alkaryl or aralkyl, X is oxygen or sulfur, R' and R'' are hydrogen or alkyl groups with 1 to 20 carbons, Y is a metal or an unsubstituted or substituted NH_4 radical, and n is a whole number. These compounds can also be used to reduce corrosion in internal combustion engine cooling liquids containing 25% of an antifreeze such as glycerol or ethylene glycol. They are also effective in oil-water emulsions containing an emulsifying agent. Effective compounds cited include sodium, magnesium and ammonium p-nonylphenoxyacetates.

Sea water, cooling systems, glycols, corrosionproofers, patent

PDL-40530

U.S. Office of Naval Research (O.P. Arora, G.R. Ramagopal and M. Metzger--Illinois. University. Dept. of Mining and Metallurgical Engineering)
CATALYTIC EFFECTS IN THE INTERGRANULAR CORROSION OF HIGH-PURITY ALUMINUM IN HYDROCHLORIC ACID
Technical Report No. 4 (December 1960) 33 p.

Aluminum, corrosion, intergranular, hydrochloric acid, aqueous, catalysis

1961 Met 86
Vol.19 PDL-37916

Ambler, H.R. (Gt. Brit. Ministry of Supply)
ATMOSPHERIC SALINITY AND METAL CORROSION AT VARIOUS PLACES IN GREAT BRITAIN
J. Applied Chem. (London) 10:213-225 (May 1960)

The distribution of air-borne chloride, sulfate and ammonia in different localities in Great Britain at various distances from the sea was determined by paper candle methods, rain water procedures and by direct count from deposition on a chemically sensitized surface. The results support the general relation between distance from the sea and chloride deposition found earlier in Nigeria, West Africa. Salinities of some sites are different from what might be predicted from their geographical situation.

Corrosion of steel and zinc panels exposed for up to 12 mo shows little variation from site-to-site and is unrelated to salinity. Sulfur dioxide and the amount and specific nature of air-borne dust may be significant factors. Site-to-site variation is greater with aluminum. Movement of exposed surfaces of metals results in increased salt deposition and subsequent corrosion.

Steel, zinc, aluminum, corrosion, atmospheric, contaminants, U.K.

PDL-40516

Battelle Memorial Institute, Columbus, Ohio. Defense Metals Information Center (C.J. Slunder, and W.K. Boyd)
ENVIRONMENTAL AND METALLURGICAL FACTORS OF STRESS-CORROSION CRACKING IN HIGH-STRENGTH STEELS
Report 151; PB 151110 (April 1961) 21 p.

Steel, stainless, stress, corrosion, cracking, mechanism, review

1961 Misc 33
Vol.19 PDL-41490

Vega, Theodore, and Clifton J. Seymour (Riverside County Air Pollution Control District, Riverside Calif.)

A SIMPLIFIED METHOD FOR DETERMINING OZONE LEVELS IN COMMUNITY AIR POLLUTION SURVEYS

J. Air Pollution Control Assoc. 11:28-33,44 (January 1961)

Cumulative data obtained on ozone levels in community air pollution surveys are based on the quantitative linear relation existing between the extent of crack depth in a rubber strip and the exposure time to a given concentration of ozone.

Ozone sensitive rubber strips of the same stock used in Los Angeles County tests (40 mm x 8 mm x 1/16 in.) are suspended from clips in a No. 2 1/2 tin can with bottom removed and four holes for ventilation. The strips, elongated 10% by a lead weight attached to their lower ends, are exposed for 15 to 16 days, removed, and stored for later measurement of crack depth using a microscope with a micrometer eyepiece. A procedure is given for calibrating the rubber strips so that the depth of crack observed on the rubber strip exposed to the atmosphere can be converted to show the average ozone concentration to which the strip has been exposed.

If the flow is maintained so that it is nearly that of change of surrounding air (minimum flow), the effect of flow is obviated and the reaction curve approaches an ideal linear relation. The effect of temperature within the range reported (59 to 95 F) appears negligible.

Air, ozone, analysis

1961 Misc 34
Vol.19 PDL-41105

Chertkov, Ya.B., N.A. Ragozin, and N.I. Marinchenko
COMPOSITION OF DEPOSITS FORMING IN FUEL FILTERS OF JET TRANSPORT AIRCRAFT (in Russian)
Khimiya i Tekhnologiya Topliv. i Masel No. 4:57-60 (April 1961)

Deposits formed in filters of fuel reservoir pumps and in jet airplane 40-μ fuel filters during 100 hr of flight were analyzed. The fuel was TS-1 gasoline, conforming to specifications GOST 7149-54. Temperature in the reservoir was that of the outside air; in the fuel system, 45 to 50 C. The deposits in fuel filters consisted of 70 to 90% ash (27 to 42% oxygen and 44 to 51% ash) and of 30 to 10% organic material. Deposits in the reservoir filters contained less organic matter and more oxygen in the ash. The ash consisted mainly of iron and zinc oxides, originating from iron pipes and the zinc-coated body of the reservoir. Considerable quantities of silicon present came from dust contamination. Iron content was higher but copper, tin, cadmium, sodium, calcium, and magnesium contents were lower than in fuel filter deposits. Source of the sulfur, nitrogen and oxygen present in considerable quantities in the organic part of the deposits were the nonhydrocarbon fuel components. In deposit formation, the inorganic particle act as nuclei on which the tar substances, characterized by adhesive properties, form a network which gradually increases in density and size until the particle diameters exceed that of the filter pores. To reduce or eliminate deposits, the nonhydrocarbon impurities must be removed from the fuel by purification processes and the ash particles by adequate filtration.

Fuel, jet, deposits, filters, analysis

1961 Misc 35
Vol.19 PDL-36896

Western Petroleum Refiners Assoc. Tulsa, Okla. (In collaboration with the U.S. Bureau of Mines. Petroleum Experiment Station, Bartlesville, Okla.)

DISTILLATE FUEL STORAGE STABILITY. STORAGE DATA-FUELS AND BLENDS

Summary Report (n.d.) 103 p.

With the objective of finding unstable fuels and fuel blends incompatible in storage, 34 distillates and 250 blends were stored in vented bottles at 110 F and in drums at ambient temperature. All of the distillates and 60 of the blends also were stored at 110 F with one or more contaminants including iron, copper or galvanized wire with or without tap or sea water.

Under ambient conditions, straight run fuels were the most stable; catalytically cracked, intermediate; and thermally cracked, the least stable. Oxidation was a major factor in gum formation during storage. When stored with contaminant, formation of soluble gum and insoluble gum was accelerated by the same conditions. Iron did not catalyze gum formation in any of the fuels or blends. Copper was catalytic in all three types of fuels; attack was not appreciable in some straight run and catalytically cracked fuels. A number of fuels were sensitive to contact with galvanized iron, especially after 26 wk storage. Contamination with copper and sea water was the most severe storage condition.

At 110 F, there was no immediate evidence of incompatability. At the end of 39 wk, however, incompatability was noted in 32 of 67 binary blends. About two thirds of the straight run and catalytically cracked fuels were incompatible and about one half of the blends of straight run and thermally cracked fuels and of catalytically cracked and thermally cracked fuels. Incompatability appears to be characteristic of certain fuels as they are incompatible in most of their blends. Certain fuels appear to contain natural inhibitors that improve compatability. A fresh fuel is compatible with the same fuel after aging.

No combination of data was found that will permit consistent prediction of storage stability of fuels or blends. Accelerated storage procedures accelerate

soluble gum formation more than formation of insoluble gum. Storage in vented bottles and in vented steel drums at ambient temperature is very nearly equivalent. Drum storage appears to be slightly more severe. Bottle storage at 110 F for 13 wk is approximately equivalent to either drum or bottle storage at ambient temperature for 1 yr.

Fuels, storage, contaminants

PDL-41723

Nopco Chemical Co., Newark, N.J.
WATERPROOFING OF LEATHER
Gt. Brit. Pat. Spec. 850,726; October 5, 1960. 8 p.

Leather is waterproofed without discoloration or loss of air or water vapor permeability by treating for 30 min with a 3 to 10% aromatic solvent solution of aluminum isopropoxide, followed by immersion for 15 to 30 min in a 3 to 10% solution of an aliphatic monocarboyxlic acid having 12 to 24 carbons. Excess reagent is removed by washing in the solvent for 5 min after which the leather is air dried. Preferred acids are lauric, oleic, and stearic; preferred solvents, benzene, toluene and xylene.

Leather, waterproofer, aluminum compounds(organic), patent

PDL-41231

Wang, Shih Yi (Tufts University School of Medicine, Medford, Mass.)
PHOTOCHEMICAL REACTIONS IN FROZEN SOLUTIONS
Nature 190:690-694 (May 1961)

Solutions, freeze, light

1961 Misc 37
Vol.19 PDL-40643

McMullen, John J.
PROBLEMS ASSOCIATED WITH THE USE OF BUNKER "C" FUEL
Intern. Shipbuilding Progress 8:130-139 (March 1961)

The poor quality of presently available Bunker "C" fuel is attributed to increased crude runs, lower quality crudes and refining methods that maximize distillate yields at the expense of heavy residual oils. Precombustion problems in use of these oils include formation of sludge resulting from precipitation of insoluble constituents of oil, and oil emulsification with water contaminants. Water-oil emulsification also results in corrosion of the fuel system. The presence of properly compounded precombustion additives prevents growth and helps to break up large particles of organic sludge.

Post-combustion problems include ash content, and fouling and corrosion of combustion equipment. These problems occur in gas turbines, steam and diesel plants. The low melting temperature of sodium and vanadium play an important role in initiation and subsequent build-up of slag formation. Sodium sulfate constitutes a large percentage of these deposits with the balance oxides, vanadates, and sulfates of other metals present. Addition of inorganic type additive, particularly magnesium and silicon compounds, have been successful in gas turbines and steam boilers by increasing the melting point of the oil ash. Effectiveness depends on type of material, and vanadium/or ash content of the oil. Washing and centrifuging removes sodium which is responsible for promotion of deposits. A combination of restricting oil to an ash content of less than 400 ppm and washing appears to be a desirable solution to post-combustion problems.

Oil, fuel, deposits, combustion products, review

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PDL-39439

Mitton, R.G., and K.G.E. Wyatt (Lederforschungsinstitut BLMRA, Egham, Eng.)
THE ACTION OF PERSPIRATION ON INSOLE LEATHER (in German)
Leder 11:285-293 (December 1960)

Laboratory tests indicated that the strength losses of insole leather are caused mainly by moist heat and not by chemical action of the solid perspiration constituents. When, for example, vegetable tanned samples were soaked for 30 min (with shaking) in 128 combinations of urea, ammonium lactate, disodium phosphate and sodium chloride at pH 8.7, and dried at 21 and 40 C, strength losses were negligible. Linear shrinkage, even with solutions 10 times the concentration of natural sweat, only slightly exceeded 1%. In another test series, chrome and vegetable tanned samples, repeatedly dried and soaked in distilled water at a raised pH, then stored at 40 C in moist air for 6 mo, showed losses in tear strength of 50 lb (chrome), 46 lb (semichrome), and 56 lb (vegetable). For natural sweat, studied under identical conditions, the respective strength losses were 32, 34, and 25 lb.

Leather, perspiration, foreign

PDL-41785

U.S. Arsenal, Rock Island, Ill. (R. LeMar)
DEVELOPMENT OF A GEL-RESISTANT PRESERVATIVE OIL
Report 61-999;...PB 171581 (March 1961) 26 p.

Oil, storage, viscosity improver, formulation, tests

1961 Misc 39
Vol.19 PDL-41104

Chernyaskaya, L.F., and I.F. Foyt
COMPARING METHODS OF DETERMINING CORROSION STATE OF MOTOR OILS (in Russian)
Khimiya i Tekhnologiya Topliv. i Masel No. 4:70-72 (April 1961)

There are two standard methods for testing the corrosivity of motor oils: both are based on the measurement of weight loss (gm/sq m) of a lead plate when subjected to alternate action of oil and air, and both measure the potential corrosivity of oil, since corrosive oil oxidation products are formed during the tests. In the Pinkevich method (GOST 5162-49) the temperature of the air is not specified, but it is lower than that of the oil (140 C). In the Ramaiya method (NAMI of GOST 8245-56 standard) the temperature of both the oil and the air is 140 C.

Corrosivity of three motor oils was tested by the two methods at 140 and 150 C. The test time for the Pinkevich method was 50 hr, for the NAMI method 5,10, 15,20, and 25 hr. The NAMI method gave high reproducible results, with deviations from the mean of $\pm$ 2 gm/sq m for a wide range of corrosivity, and only at high corrosivity values reached $\pm$ 5 gm/sq m. Approximately the same values were obtained by the Pinkevich method and by the 10-hr NAMI method, hence the NAMI method has the advantage of being more rapid. To further determine the value of this method, it was applied to test the actual corrosivity of one of the motor oils containing varying concentrations of oleic acid in amounts to give an acid number range from 0.2 to 1.4 and, also, to test the effect on the oil corrosivity of corrosion inhibitors. For this purpose, the lead plates and the oil were heated at 140 C for 30 min in a closed container. Since no oxidation products were formed during the test, corrosion of the metal was due only to corrosive products already present in the oil. The corrosivity was expressed as the weight loss of lead in gm/10 sq cm. Under these conditions, too, the method gave reproducible results. The data showed that the corrosivity of the oil increases steadily with increasing acid number, and that the anticorrosive additives are more effective at low than at high concentrations of oleic acid. Differences in the activity of the various inhibitors could be clearly

established. Thus, the NAMI method can be recommended not only for testing the potential corrosivity of motor oils, but also their actual corrosivity, and for the comparative evaluation of corrosion inhibitors.

Oils, lubricant, corrosivity, test, comparison, foreign

PDL-41721

Atlantic Refining Co., Philadelphia, Pa.
MOTOR FUEL COMPOSITIONS
Gt. Brit. Pat. Spec. 857,068; December 29, 1960. 6 p.

Icing of a hydrocarbon base motor fuel is prevented by addition of 0.001 to 0.09 vol % of a mono- or polyether. Suitable compounds are formed by condensing 1 mol of an alkyl phenol in which the alkyl group contains 5 to 12 carbons with 1 to 7 mols of an alkylene oxide having 2 or 3 carbons.

Gasoline, iceproofing, patent

PDL-41782

Lockheed Aircraft Corp. Missiles and Space Division. (A.A. Beltran, comp.)
ATMOSPHERIC OZONE: ITS DETECTION, MEASUREMENT AND EFFECTS, 1940 to 1959. AN ANNOTATED BIBLIOGRAPHY.
SRB-60-3.....ASTIA Doc. 241588 (July 1960) 62 p.

Ozone, atmosphere, measurement, analysis, meteorology, bibliography

PDL-41213

McGill University, Montreal. Arctic Meteorology Research Group
TEMPERATURE AND WIND FREQUENCY TABLES FOR EURASIA. SUPPLEMENT TO VOL. 4 (OCTOBER-DECEMBER) 12 p.

Temperature, wind, arctic, tabulation

1961 Pkg 5
Vol.19 PDL-41177

Gintsberg, S.A., and A.V. Shreider
AMINO SALTS OF SOME INORGANIC ACIDS AS RETARDERS OF ATMOSPHERIC CORROSION OF METALS (in Russian)
Zhur. Priklad. Khim. 33:2366-2368 (October 1960)

Wrapping paper was impregnated with mono- and triethanolamine salts of phosphoric, boric, tungstic, and molybdic acids in amounts to give a concentration of 15-20 gm/sq m. Samples of steel and of nonferrous metals were wrapped in the impregnated paper, then exposed up to 64 days to air at 92-94% RH with alternate heating to 40 C for 1 hr and cooling to 20 C for 2 hr. Sulfur dioxide (0.01 mg per liter of air) was introduced daily in the corrosion chamber. The corrosion of steel was estimated by the fraction of the total surface affected, that of nonferrous metals in units of an arbitrary scale. Volatility of the compounds at 20 ± 2 C and 50 ± 5% also was determined.

Monoethanolamine salts were generally characterized by lower volatility than the triethanolamine salts. Triethanolamine borate was the most volatile, monoethanolamine tungstate, the least. The protective action, however, was not related to volatility, and was determined primarily by the nature of the anion. Borates, phosphates, and triethanolamine molybdate were effective in protecting steel against corrosion, whereas tungstates stimulated the corrosion of steel. None of the compounds had any effect on the corrosion of nickel, and all stimulated the corrosion of brass. Tungstates and phosphates stimulated zinc corrosion; borates inhibited it. Thus, among the compounds tested, only borates showed promise as corrosion inhibitors for products made of steel and containing nickel or zinc-coated parts.

Paper, packaging, amines, corrosionproofer, ferrous, nonferrous, foreign

1961 Pkg 6
Vol.19 PDL-38993

Marchlewska-Szrajer, J.
CORROSIONPROOF PAPERS. II. PRACTICAL EXPERIENCES (in German)
Zellstoff u. Papier 9:187 (May 1960)

Ball bearings degreased with trichloroethylene were wrapped in variously treated paper, placed in crates lined with bituminous paper and shipped from Gdynia, Poland to Canton, China and back. Similarly wrapped bearings were stored on wood supports in a warehouse.

Bearings without lubricant wrapped in paper coated on one side with 'Leukorrosin' and on the other with paraffin showed no corrosion on ground sections and only traces on the forged surfaces after 4 mo transport, and none after 1 yr storage. Bearings lubricated with a 1 to 5 mixture of spindle oil and gasoline behaved similarly. Bearings wrapped in paper containing sodium benzoate and coated on one side with paraffin showed no corrosion on the ground and only isolated points on the forged parts after the sea voyage and only limited corrosion areas on storage. Bearings wrapped in paraffin impregnated paper had clearly perceptible corrosion after transport and storage.

Packaging, paper, corrosionproof, comparison, foreign

PDL-41702

Jones, S. Rees
CLIMATOLOGY AND CONSERVATION IN MUSEUMS
Nature 191:1050-1051 (September 1961)

Museum, preservation, climate

1961
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PDL-39370

Petrik, Karl
METHOD FOR THE PREPARATION OF MATERIALS USED FOR PACKAGING OF METALS, ESPECIALLY PAPER OR FIBROUS MATERIAL SIMILAR TO PAPER (in German)
Ger. Pat. 970,669; October 16, 1958. 2 p.

Rust-preventive packaging (fiber or film) materials for iron and its alloys are obtained by impregnation with solutions containing nitrites, sulfates, and optionally carbonates. Paper, for example, is impregnated with a solution containing: water 100, sodium nitrite 40 to 60, sodium sulfate 5 to 10, and sodium carbonate 5 to 10 parts. A principal advantage of the method is that impregnation can be effected during production of the fibrous materials or foils.

Packaging, paper, corrosionproofing, vapor phase inhibitor, nitrite, patent, foreign

PDL-41701

CORROSION PREVENTION ASPECTS OF PACKAGING EXPORT MACHINERY
Corrosion Technol. 8:283-284 (September 1961)

Packaging, corrosionproofing, machinery, review

1961 Pkg 8
Vol.19 PDL-41446

U.S. Wright Air Development Division (Bolt Beranek and Newman, Inc. - Karl S. Pearsons and Eric E. Ungar)
DEVELOPMENT OF PACKAGING MATERIAL WITH CONSTANT RESTORING FORCE
WADD Technical Report 60-573...ASTIA Doc. 253959 (December 1960) 64 p.

On the basis of brief theoretical analyses, it is shown that packaging materials with constant restoring force characteristics can result in better vibration and shock isolation than materials with more nearly linear force-displacement behavior. Theoretical models of constant restoring force materials involving buckled linkages and columnar configurations are proposed and analyzed. Realizations of these models are discussed, and results of static and dynamic tests are presented for some experimental configurations. It is shown that the materials developed so far are capable of effecting considerable weight or volume savings over commonly used foams, particularly for packaging either very delicate or very massive items.

Packaging, design, theory

PDL-36004

Cavallaro, Leo and Giorgio Mantovani
NEW INVESTIGATIONS ON VAPOR PHASE INHIBITORS (in German with English summary)
Werkstoffe u. Korrosion 10:422-425 (July 1959)

Metals, corrosion, vapor phase inhibitors, storage, packaging, tests, foreign

1961 Plas 51
Vol.19 PDL-39500

Meltzer, Theodore H., and John J. Muldrew, (Electric Storage Battery Co., Carl F. Norberg Research Center, Yardley, Pa.)
THE MEASUREMENT OF POLYETHYLENE DEGRADATION BY ZST TEST
SPE Journal 17:77-82 (January 1961)

The zero time test (ZST) involves placing a standard notched strip of polyethylene supporting a standard weight vertically in a preheated furnace and measuring the time until the plastic has zero strength as evidenced by rupture of the sample at the notch under the burden of the weight. Values vary directly with specimen thickness and inversely with temperature and melt index values. A suitable test temperature for conventional polyethylene under a load of 7.5 gm is 130 C; for linear polyethylene, 160 C.

A comparison of melt index values and ZST data for a number of polymers shows that ZST measurement is more sensitive. Both methods, but particularly the melt index, have limitations where oxidative changes are very large. ZST and melt index curves are not superimposable because for the latter test the plastic is well above its crystallinity point before flow measurements are made, whereas in the ZST test as much as one third of the heating time involves the solid state property of crystallinity.

Polyethylene, tests, decomposition, oxidation

PDL-41293

National Research Council. Prevention of Deterioration Center (Richard W.H. Lee)
AN INTRODUCTORY BIBLIOGRAPHY ON MICROBIAL RESISTANCE OF THERMOSETTING PLASTICS
(September 1961) 8 p.

Polymers, microorganisms, fungi, bacteria, toxics, inherent resistance, bibliography

Deterioration
NRC

1961 Plas 52
Vol.19 PDL-41810

Akron. University. Institute of Rubber Research
(K.W. Scott, V.R. Allen, R.D. Gates and M. Morton)
STRESS RELAXATION AND STRUCTURE OF HIGH TEMPERATURE ELASTOMERS
U.S. Office of Naval Research, Contract Nonr 2573(00), Final Report (June 1958-May 1960) ASTIA Doc. 250735. 59 p.

Sol-gel relations in natural rubber vulcanizates were studied both during network formation and degradation. Experimental values obtained during network formation, using swelling measurements to determine crosslink density, deviated markedly from theory, both as to magnitude and in unexpected dependence on primary chain length. This deviation was shown to be due to 'physical' crosslinks, resulting from chain entanglements trapped during network formation. The total number of elastically effective chain entanglements per unit volume and also the effectiveness of a chain entanglement were a function of the concentration of 'chemical' crosslinks.

The theoretical expressions of Horikx for network degradation were modified to include the effect of chain entanglements. Based on this modified theory, it was concluded that the thermal degradation of many vulcanizates of natural rubber occurs by randon scission of network chains. A similar type of degradation was found in Viton A elastomer when vulcanized by amines.

Elastomer, rubber, structure, stress

PDL-41686

Gallagher, Joseph W. (Hughson Chemical Co.)
A SIMPLER, EFFECTIVE SYSTEM FOR RUBBER-TO-METAL BONDING
Rubber World 144:75-84 (September 1961)

Adhesives, metals, rubber, elastomers

Deterioration
NRC

1961 Plas 53
Vol.19 PDL-38523
Hosler, E.R., J.F. Chivot, R.J. Korpi, and
J.W. Westwater (Illinois. University)
DIFFUSION OF WATER VAPOR IN PLASTIC LAMINATES
J. Chem. Eng. Data 5:164-168 (April 1960)

An unsteady-state method was devised for measuring diffusion coefficients in the three principal directions, and determining the dependence, if any, of water vapor diffusivity on concentration. Polished 1 in. cubes were cut from three different 1 in. thick phenol-formaldehyde laminates conforming to ASTM Grades X, XXX, and C. The first two are paper based; the third, cotton canvas based. All are anisotropic.

Unidirectional diffusivities of specimens brought to equilibrium with a 31% RH atmosphere at 23 C were determined by exposing one side at a time to a range of controlled higher humidities, with the other five sides immersed in a mercury bath. Exposures were made at 23 and 40 C. An ultraviolet lamp eliminated molds and fungi. To determine equilibrium concentrations reasonably quickly, 0.1 in. thick specimens were exposed to the same initial and final atmospheres as the cubes. Weight change terminated within 20 days. The per cent weight gain between initial and final conditions was assumed to be true for the thicker specimens.

Disagreements between duplicate tests averaged 18%. For all materials at all humidities, diffusivities at 40 C were generally 5 to 10 times greater than at 23 C. Ignoring the possible factors of specimen stress, concentration of diffusing medium, time, absorption, surface diffusion, and capillary flow, the average value of the activation energy is estimated at about 22,000 cal gm/mole. Recommended equations are submitted.

Diffusivities in the X and Y direction were similar for any one material, and universally greater than z (perpendicular to lamination) diffusivities. The cloth base laminate was significantly more permeable than the others, especially in X and Y directions. Where detected, variation in diffusivity with varying humidity was neither great nor systematic. Methods of testing for concentration-dependence are discussed. Diffusivity may be stress-dependent: short term divergence of data at

different humidities may be attributable to the factor of intra-specimen development of inequalities of stress pending overall saturation. Development of considerable stress during absorption was evidenced by visible cracking in some specimens. Observation of inflection points precludes application of the osmotic pressure theory to these materials.

Laminates, phenol-formaldehyde, polymers, water vapor, diffusion, measurement

PDL-41851

Hunter, Paul H., and Calvin C. Cooper (Union Carbide Plastics Co., Bound Brook, N.J.)
NEW TEST SPEEDS POLY-PAPER TESTING, PINPOINTS FAILURES
Package Eng. 6:66-69 (November 1961)

A new method of detecting and describing the point of failure in polyethylene-coated paper pouches in contact with oil and grease is described. A small amount of Rhodamine B Base dye is added to the oily test material which is then packed in sealed pouches of the coated paper. After storing, it is visually inspected at intervals until three of five samples fail. The nearly colorless oil-dye mixture becomes vivid red when it penetrates the coating and reaches the outside layer of paper. Failure is of two types: (1) localized failure where a small red spot appears and grows larger, and (2) overall penetration where a uniform red coloration of the paper develops within the sealed area.

Paper, coatings(organic), polyethylene, oilproofing, test

1961 Plas 55
Vol.19 PDL-41107

Popov, A.M.
THE PREVENTION OF DAMAGE TO NONMETALLIC CABLE SHEATHINGS BY RODENTS (in Russian)
Vestnik Sviazi 19:37-38 (March 1959)

Means are discussed of preventing extensive rodent damage to plastic sheaths. Incorporation of shale oil, creolin, or other chemicals into poly(vinyl chloride) cable sheaths of underground radio-communications cables was completely ineffective against rodent damage under field conditions. Various mechanical means have been suggested of preventing the access of rodents to the cables, e.g., packing of the ground above the cable drain, or making a narrow cut below the normal drain so that the cable laid in the narrow cut is covered with the soil from the upper drain. A combination of the two methods is suggested. This can be accomplished by mounting an additional thin blade below the normal cutting edge of the cable-laying machine, and equipping it with a soil-packing device. In this way, the cable can be laid deep in the narrow drain cut by the lower blade, the drain filled with loose soil cut by the upper blade, leaving no empty spaces around the cable, with firmly packed soil on the top. Such modified cable-laying machines have been constructed and are to be used in areas heavily infested by rodents.

Cable, underground, sheath, vinly chloride, polymers, rodentproofing, foreign

PDL-41783

Burke Research Co., Van Dyke, Michigan (F.C. Bruce, B.P. Hunt and R.E. Isley)
DEVELOPMENT OF OZONE RESISTANT POLYMERS WITH LOW HYSTERESIS
Report No. 11;...ASTIA Doc. 250505 (October 1960) 85 p.

Elastomers, polymers, extenders, vinyl resin, styrene, butadiene, tire, ozoneproof, synthesis, progress report

1961 Plas 56
Vol.19 PDL-41311

Steinberg, Priscilla L. (Bell Telephone Labs., Inc., Murray Hill, N.J.)

RESISTANCE OF ORGANIC MATERIALS TO MARINE BACTERIAL ATTACK

Developments in Industrial Microbiology, Vol. 2, p. 271-281. Plenum Press, Inc.

Two laboratory tests used to measure the resistance of organic materials to aerobic and anaerobic marine microorganisms. In the Biological Oxygen Demand Tests (BOD), the amount of dissolved oxygen consumed in 8 wk at 5 and 20 C in aged and inoculated sea water is taken as a direct measure of the utilization of organic material as a source of carbon. In the anaerobic tests, the amount of hydrogen sulfide produced as a by product is deaerated inoculated sea water over a 20 wk period at 20 C is a measure of the utilization of the organic material by anaerobic sulfate reducing bacteria.

Materials which were not attacked (i.e., used as a source of food) in either test included polyethylene with and without carbon black and/or antioxidant, polypropylene with and without antioxidant, an epoxy casting resin, a silica-filled styrene-polyester casting compound, poly(vinyl chloride) with no added plasticizer, nylon from three sources, Mylar, Kel F, Teflon, Penton, cellulose acetate and triacetate, and polycarbonate.

Elastomers were utilized by aerobic bacteria more readily than any other general type of material. Since they are generally compounded with lubricants, oil and waxes and, in some instances, external plasticizers, the exact cause of attack is difficult to determine. Since the plasticized but not pure PVC is attacked, the plasticizer or lubricant appears to be the nutrient material. Fatty acid type lubricants or external plasticizers containing fatty acids seem especially susceptible. In all tests jute was readily utilized.

Marine bacteria, polymers, elastomers

Deterioration
NRC

1961 Plas 57
Vol.19 PDL-39004

Loetel, C.E., and H.E. Fordyce (Marley Co., Kansas City, Mo.)

LONG-TERM WET STRENGTH OF POLYESTER RESINS

SPE Journal 16:1137-1139 (October 1960)

Comparative test data on a range of die-moldable, fast curing polyester resins are presented. Resin, free of pigment and filler, was catalyzed with either 1% benzoyl peroxide (BP) or 0.5% BP + 0.5% methyl ethyl ketone peroxide and adjusted to a 43% styrene or 43% vinyltoluene content. Press-cured at 250 F for 3 min or to hardness, the finished 0.11 in.-thick laminate contained 31% by wt resin and 69% vinyl trichlorosilane-finished glass cloth. Some commercial laminates conforming with Spec. MIL-R-7575A also were tested. Aging is not mentioned.

Cut specimens were exposed in water at 160 and 200 F, and in steam at 10 psi for up to 180 days, with periodic determinations of flexural strength at 70 F. Loss of 50% initial strength within 90 days at 200 F disqualified almost all the commercial resins.

In general, the isophthalic based polyesters were better in wet strength retention than the average phthalic anhydride based resins. A bisphenol based polyester was the only resin that did not continue to lose strength with time; in 200 F water it retained 93% at 30 days, 86% at 60 days and 84% at 123 days. With the composite catalyst, it had a pot life of 2 mo at 70 F. A chlorendic acid based resin also showed good wet strength retention. Although the effect varied with the resin, the composite catalyst gave generally greater retention than did 1% BP. In most cases initial strength was lower, but increased during early exposure before showing a decline. Substitution of vinyltoluene for styrene had no effect on strength but eliminated blistering occurring in parts made of styrene. With one exception (an abietic acid polyester), wet strength retention was related closely with low resin acid number.

Polyester, polymers, mechanical properties, water, high temperature

Deterioration
NRC

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Cooper, Glenn D., and Maurice Prober (General Electric Co., Schenectady, N.Y.)

THE ACTION OF OXYGEN CORONA AND OF OZONE ON POLYETHYLENE

J. Polymer Sci. 44:397-409 (June 1960)

Films of low-density polyethylene, exposed to corona discharge in oxygen at a pressure of 1 atm, lost weight in direct proportion to exposure time and independent of film thickness. Decrease in thickness was due to oxidation of the surface to volatile products - - principally carbon dioxide and water. After exposure to the discharge, the infrared spectra showed a strong band at 1717 cm^{-1} due to the formation of carbonyl groups. Carbonyl band intensity rapidly increased initially but reached a maximum after 4 hr and then showed no further change up to 90 hr. Originally 4 mils thick, the film was reduced to approximately 1 mil. Caronyl groups are present in a relatively thin oxidized layer, estimated to be between 5×10^2 and 7×10^4 A in depth. When a steady state is reached formation of carbonyl groups is balanced by their oxidation to volatile products at the surface. Carbonyl groups also are formed in ozone exposed films outside the discharge area. Infrared spectra of both types of oxidized film showed virtually no difference and the position of the main band is consistent with ketones or associated carboxylic acids groups. The relative amounts of the two were determined by soaking film in ethanolic sodium hydroxide solution to convert the acid to carboxylate ion, and measuring the decrease in intensity of the 1717 cm^{-1} band. In the sample which was exposed to the discharge, 60% of the carbonyl was ketone and 30% acids. The carbonyl groups in both cases are believed to result from ozone attack on the carbon-carbon double bonds of the polymer.

Polyethylene, oxidation, corona, ozone, mechanism

1961 Plas 59
Vol.19 PDL-41447

Gt. Brit. Ministry of Aviation (W. Kern, and H. Cherdron)
THE DECOMPOSITION OF POLYOXYMETHYLENES
Technical Information and Library Services TIL/T.5214 (March 1961) 14 p. Translated from Makromol. Chemie 40(1/2):101-117 (1960)

Quantitative measurements of the degradation of polyoxymethylenes under different conditions show that essentially five reactions take place: (1) depolymerization, starting at both ends of the polymer chain, (2) autooxidative fission, (3) decomposition by secondary products of auto-oxidation, (4) thermal degradation, and (5) hydrolysis and acidolysis. Possible means of preventing these breakdown reactions are given and a method for testing thermal stability is proposed.

Depolymerization reactions in polyoxymethylenes starting from the chain ends begin at about 100 C, autooxidation at about 170 C and thermal degradation at about 270 C. Individual energies of activation for the three reactions, obtained by graphical solution of the Arrhenius equation, are 10, 14.5, and 28 kcal mol^{-1}, respectively. The first two values agree with those for other polymers; the value for thermal degradation is relatively low.

Polymers, polyoxymethylenes, decomposition, high temperature, mechanism

PDL-40621
41050-41052

Dubois, P., and J. Hennicker
THE AGING OF PLASTICS PARTS I, II, III, IV
Plastics (London) 25:428-430 (October 1960); 474-478 (November 1960); 517-520 (December 1960); 26-115-116 (January 1961)

Polymers, aging, mechanism, tests, test equipment, accelerated aging, weathering

1961 Plas 60
Vol.19 PDL-41178

Beachell, Harold C., and G. Wilfrid Tarbet (Delaware. University)

THE OXIDATIVE DEGRADATION OF POLYETHYLENE

J. Polymer Sci. 45:451-459 (August 1960)

The nature and extent of atmospheric oxidation at elevated temperatures of thin films of branched low density polyethylene, linear high density polyethylene and two deuterated polyethylenes were studied. A grating spectrophotometer covering the 5-7 μ region was used to follow the production of carbonyl groups during oxidation.

The use of deuterated polyethylenes supports the formation of aldehydes in addition to ketones, in the primary oxidation step after the production of hydroperoxides. Normally the aldehydes and some of the ketones are oxidized to acids which react with hydroxyl groups in other reactions to give esters. Linear polymers start to oxidize later than branched ones, but, once begun, oxidation proceeds faster and to a greater extent. None of the accepted mechanisms suggest that linear chains should oxidize rapidly, thus it is probable that the high crystallinity or degree of order provides the resistance to oxygen; when this order is lost, oxidation takes place and the fast reaction ensues. This also occurs in the branched materials, but since they have already partially oxidized and have a lower crystallinity (50-65% compared with 90% for linear), the effect is not so marked. The deuterated polyethylenes, being made with a Ziegler-type catalyst, are assumed to be almost linear and highly crystalline.

Polyethylene, oxidation, high temperature, mechanism

1961 Plas 61
Vol.19 PDL-41550

Howse, Paul T., Jr and C.D. Pears (Southern Research Institute, Birmingham, Ala.)
THERMAL PROPERTIES OF REINFORCED PLASTICS
Modern Plastics 39(1):140, 142-144, 146, 149, 153, 246, 248 (September 1961)

Specific heat, thermal expansion, and thermal conductivity were determined for twelve variously reinforced laminates and moldings of epoxy, phenolic, and silicone resins and one silicone foam core over the range -50 to 700 F.

Specific heat was about constant with temperature and seemed influenced more by reinforcement material than by any other single parameter, probably because the reinforcements varied more in heat capacity than the resins. The glass-reinforced materials had the lowest specific heats (0.25 Btu/lb/^{o}F for a silicone reinforced with glass), followed in order by asbestos-reinforced, and the one nylon-reinforced material (0.47 Btu/lb/^{o}F for a phenolic reinforced with glass). The specific heat apparel to be the weighted average of basic resin and reinforcement after make-up and postcure.

The expansion coefficient was influenced primarily by both overall composition and fiber orientation, progressing from a minimum when determined at 0^{o} to the major axis of the fibers, to a maximum at 90; isotropic expansion approximated the 0^{o} value. Expansion of a material normal to the panel had the same characteristics, but of greater magnitude, as expansion parallel to the panel, indicating that the resin controls the character and fiber orientation the magnitude. Expansion properties may be completely altered after exposure to a critical temperature range.

Thermal conductivity of a material increased with temperature to a critical temperature and was influenced by production method, reinforcement orientation, and composition. Conductivity determined edgewise to a panel was influenced more by reinforcement than resin.

With glass-reinforced panels, conductivity was

considerably higher edgewise than normal to the panel. Conductivity normal to panel was influenced more by resin than reinforcement.

Laminates, reinforcements, moldings, temperature, physical properties, epoxy, phenolic, silicone, polymers, asbestos, glass, nylon

PDL-41266

General Tire and Rubber Co., Akron, Ohio
WEATHER AND AGE RESISTANT POLYURETHANE COMPOSITIONS
Gt. Brit. Pat. Spec. 846,176; August 24, 1960. 7 p.

Polyurethanes with good weather and age resistance are made using aromatic polyisocyanates in which the NCO group is separated from the aromatic ring by at least two carbon atoms. This structure prevents resonance and eliminates formation of color forming intermediates. Suitable isocyanates are p-phenylene-2,2' (ethyl isocyanate), p-phenylene-3,3'-bis(propyl isocyanate) and p-phenylene-4,4'-bis(butyl isocyanate). A weather resistant polymer is made by reacting (1) about 0.5 to 12 mols of aromatic polyisocyanate, of which at least three fourth is the type described above, with (2) one mole of a long chain polyester or polyether with a mol. wt of at least 500, preferably 1500 to 2500, and a terminal hydroxy group containing active hydrogen. These formulations are useful for coatings, foams and elastomers.

Urethane, polymers, weatherproof, formulation, patent

1961 Text 23
Vol.19 PDL-41255

Blouin, Florine A.,Jett C. Arthur, Jr., Rollin S. Orr, and Vega J. Ott (U.S. Agricultural Research Service. Southern Regional Research Laboratory, New Orleans, La.)
THERMAL NEUTRON IRRADIATION OF COTTON
J. Textile Research 31:597-602 (July 1961)

Purified cotton samples were irradiated in a 'pure' source of thermal neutrons in the dosage range of 5×10^{14} through 1×10^{17} neutrons per sq cm. Neutron irradiation produced chain cleavage, carboxyl groups, and reducing groups in the cellulose. The water solubility of the cotton was not appreciably affected, but wet and dry strengths and elongation decreased. Uniformity of strength along the fiber length was only slightly lowered. The reducing groups produced were markedly different in degree of reaction with sodium chlorite, copper equivalence, and influence on alkali sensitivity from the reducing aldehyde groups produced by periodate oxidation of cotton cellulose. A close similarity between the effects of thermal neutron and gamma ray irradiation on cotton was observed.

Cotton, cellulose, radiation, high energy

PDL-38903

Hausam, W., and R. Rupp
FINISHING OF TEXTILES WITH PRESERVING AND IMPREGNATING AGENTS. III. THE SOIL BURIAL TEST: EVALUATION OF SOILS FROM DIFFERENT SOURCES (in German)
Melliand Textilber. 40:1465-1468 (December 1959)

Textiles, toxics, soil, tests, foreign

1961
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Text 24
PDL-41834

Russell, A.B., and W.R. Hindson (Australia. Defense Standards Laboratories. Dept. of Supply, Maribyrnong, Victoria)
THE USE OF BURSTING STRENGTH IN ASSESSING RESISTANCE OF TEXTILES TO FUNGAL ATTACK
J. Textile Inst. Trans. 52:T428-T430 (September 1961)

The Australian standard method for determination of the resistance of cotton duck to fungal attack, using Memnoniella echinata as the test organism, may be modified by adopting bursting instead of breaking strength as the criterion for the assessment of attack. The method is simpler, more economical of space and material, and yields results that are statistically not significantly different from those obtained by the present standard procedure.

Textiles, cotton, fungi, test

PDL-41591
40640-42

Lünenschloss, J., H. Stegherr, and H. Kurth
THE EFFECT OF WEATHERING ON THE PROPERTIES OF A NUMBER OF DIFFERENT TEXTILE FABRICS (in German with English summaries)
Textil-Praxis 15:931-939 (September 1960); 1011-1017 (October 1960); 1146-1150 (November 1960); 1283-1289 (December 1960)

Natural and artificial weathering tests were carried out over a 2-yr period on plant, animal and synthetic textile fibers. Strength, elasticity, stress-strain, workability, abrasion resistance and fatigue strength were studied.

Artificial weathering which uses high-energy radiation of short wave length such as the carbon-arc lamp causes photolytic destruction of macromolecules; natural weathering damage, however, is predominantly oxidative. In outdoor weathering tests Perlon cable,

despite larger percentage losses than other fibers, retained the most strength after 1 yr. After longer periods, however, polyacrylonitrile and poly(vinyl chloride) were superior in both strength and elasticity.

Strength-strain relationships in dependence of exposure time are of greater importance than strength and elasticity individually. Plant and animal fibers showed a steep rise in the stress-strain curve. Polyamides, except for Perlon, showed a decreased modulus of elasticity. Polyacrylonitrile showed little change. Dolan and Dralon increased in strength. Properties of Rhovyl yarn were excellent. After 12 mo weathering, polyacrylonitrile and poly(vinyl chloride) exceeded Perlon in overall workability.

Abrasion resistance comparisons were difficult because of the different construction in fibers and textiles. Whereas some fibers lost resistance within 3 mo and then stayed at that level, other fibers lost it gradually. No change occurred in PVC fiber and little in polyacrylonitriles.

Bending strength tests indicate the superiority of synthetic fibers, with polyacrylonitriles and PVC far superior even after some loss in weathering. The average degree of polymerization decreased on weathering. Bending strength losses, however, could not be explained solely by decrease in polymerization. Workability was shown to be the best indicator of weathering damage.

Textiles, weathering, mechanical properties, foreign

PDL-40549

King, A. (Forschungsinstitut Hohenstein, Württ, Germany)
CHEMICAL MODIFICATION OF WOOL BY TRICHLOROACRYLOYLDIAZOMETHANE AND 1,4-DICHLOROBUT-2-YNE (in German)
Melliand Textilber. 41:729-732 (June 1960)

Wood, chemutation, foreign

1961 Text 26
Vol.19 PDL-40450

Hildebrand, D., and H. Würz (Deutsches Wollforschungs-Institut an der Technischen-Hochschule, Aachen)
EFFECTS OF IONIZING RADIATION ON FIBER KERATIN (in German with English summary)

Isoionic washed combed wool, Texas mohair and isoionic worked camel hair with known contents of amino acids and known alkali solubilities were irradiated with neutrons and gamma rays. Neutron irradiation was carried out in air at 0.2 to 5.0 x 10^{17} neutrons/sq cm at 80 C for up to 275 hr. Gamma radiation dose was 8 x 10^{6} rad at 20 C in both air and vaccum. A cobalt 60 source was used with radiation energy of 1.33 mev.

In the important amino acids, cystine, tyrosine and tryptophane, destruction was proportional to neutron dosage. Tryptophane was most susceptible. The destruction of amino acids by gamma rays, especially cystine, is dependent on the presence of air. In the absence of air cystine remained stable.

Wool, keratin, high energy, decomposition

PDL-41857

Usmanov, Kh. U., E.I. Kalabanovskaya and R.B. Damovskii
THE ACTION OF GAMMA RAYS ON THE STRUCTURE OF CELLULOSE FIBERS (in Russian with English summary)
Vysokomolekulyarnye Soedineniya 3:223-227 (February 1961)

The integral heats of wetting were determined for cotton and viscose fibers irradiated in air, nitrogen, and vacuum with doses of gamma rays from 5 x 10^{4} to 5 x 10^{7} r. Heats of wetting were greater in cotton irradiated in air than in vacuum due to increase in oxidative degradation of the cellulose. Closely packed hydrocellulose was less sensitive to the action of gamma rays than natural cellulose. Loosening of cellulose packing resulting from the radiation was a reversible process. Within 1 yr the loose structure reverted to the original dense packing.

Cotton, rayon, high energy, foreign
Deterioration
NRC

1961 Wood 57
Vol.19 PDL-41719

Allgemeine Holzimprägnierung, Dr. Wolman G.m.b.H., Sinzheim, Ger.
A WOOD PRESERVATIVE DRESSING
Gt. Brit. Pat. Spec. 833,818 April 27, 1960 2 p.

A wood preservative dressing consists of a pliable, porous, stretchable foam material impregnated with an aqueous paste of a hydrogen fluoride -- hexavalent chromium preservative and a binding agent. To avoid loss of hydrogen fluoride, impregnation and subsequent drying is carried out below 30 C. The foam may be rubber, poly(vinyl chloride), polyethylene, or a polyisocyanate crosslinked alkyd resin. A satisfactory mixture in 10 liters water contains: 32 kg potassium acid fluoride, 26 kg anhydrous sodium arsenate, 42 kg sodium bichromate, 0.3 kg commercial water soluble size based on polyacrylic acid and 0.2 kg size based on the sodium salt of carboxymethylcellulose. The paste is applied in amounts of 1.4 kg per sq m of foam. Various forms and uses of the dressing are described.

Wood, wrapping, toxic, patent

PDL-41196

Barnacle, J.E. (Australia. Commonwealth Scientific and Industrial Research Organization)
A POLE TEST AGAINST MASTOTERMES DARWINIENSIS
C.S.I.R.O. Forest Products Newsletter No. 254:1-3 (July 1959)

Termites, wood, pole, toxics

1961 Wood 58
Vol.19 PDL-39567

Akai, Shigeyasu and Akinori Ueyama (Kyoto University, Maizuru, Japan)
STUDIES ON MICROBIAL STAIN AND DECAY OF BUILDING BOARDS AND THEIR PREVENTION. I. COMPULSIVE DECAY TEST OF BUILDING BOARDS BY SOME WOOD-DESTROYING FUNGI (in Japanese with English summary)
J. Japan Wood Research Soc. 6:128-132 (June 1960)

Microbial degradation of hardboards and 2- and 3-ply particle boards was tested by immersing seasoned boards in deionized water for 4 days, then exposing them to cultures of Gloeophyllum subferrugineum, Poria vaporaria, Schizophyllum commune, Trametes dickinsii and Trametes sanguinea for 14 days at 28 ± 1 C. All the particle boards were fairly durable, showing less than 10% decrease in dry weight; 3-ply were slightly superior to 2-ply boards. Hardboards were more susceptible than particle boards to fungal attack, particularly to P. vaporaria. Fungal resistance of hardboard was significantly influenced by the use of sizing agents. A 4% phenolic resin addition increased the resistance, as expressed by weight retention, of hardboards to approximately that of the particle boards. Board sized with 5% melamine resin, however, was more severely attacked than the unsized boards. Tempering hardboard with vegetable oil did not materially improve microbial resistance.

Foreign, wood, fiberboard, laminate, fungi, Poria, phenolic resin, melamine resin

PDL-39436

Huber, Otto
PHYSICAL-CHEMICAL IDENTIFICATION OF CORROSIVE CONSTITUENTS IN PAPER AND BOARD: TESTING OF CORROSION-INHIBITOR PAPERS (in German)
Österreichische Papier-Zeitung 66:11 (June 1960)

Paper, corrosivity, standards, tests, foreign

1961 Wood 59
Vol.19 PDL-41498

Gt. Brit. Forest Products Research Laboratory, Princes Risborough, Eng.
PREVENTION OF LYCTUS ATTACK IN SAWN HARDWOODS BY USE OF "CONTACT" INSECTICIDES
Leaflet No. 43 (rev.) (January 1960) 3 p.

Application of 2% DDT, 0.5% benzene hexachloride or 0.5% dieldrin by dipping and spraying green or seasoned lumber protects against Lyctus attack during storage or seasoning. A 3-sec dip gives protection against attack for 3 yr. Complete coverage of all sapwood is desirable; about 1 gal for 120 to 200 cu ft of wood is generally satisfactory. Treatment does not destroy larvae already present in the wood; for this kiln drying is usually the most practicable method followed by spray or dip treatment to prevent further attack. The insecticide treatment also helps prevent attack by certain longhorn beetles in bark and sapwood, e.g., in beech which is susceptible to longhorn but not Lyctus attack.

Wood, toxics, beetles, nonpressure, DDT, BHC, dieldrin

PDL-41500

U.S. Forest Service. Forest Products Laboratory, Madison, Wis.
LIST OF PUBLICATIONS ON THE SEASONING OF WOOD
Report 446 (rev.)(August 1961) 21 p.

Wood, seasoning, bibliography

PDL-40603

Heebink, Bruce G. (U.S. Forest Service. Forest Products Laboratory, Madison, Wis.)
EXPLORING MOLDED PARTICLE BOARD
Wood and Wood Products 65:36 (May 1960)

Fiberboard, forms

1961 Wood 60
Vol.19 PDL-41263

Imperial Chemical Industries Ltd., London(Dennis Lee, John N. Turner and John A.W. Turner)
FUNGICIDAL COMPOSITIONS
Gt. Brit. Pat. Spec. 852,634; October 26, 1960. 15 p.

Effective fungicides are α, α'-dichloromaleimide substituted on the nitrogen by the group $(CH_2)_nR$ where R is a monocyclic carbocyclic group which may be substituted or unsubstituted and n is 0 or 1. N-(4-methylphenyl) and N-cyclohexyl compounds are particularly suitable. The compounds are useful in preservation of paper pulp, wood, reconstituted wood products such as hard board, as a slimicide in pulp and paper mills and as a foliage fungicide. Compounds are nonstaining and easily prepared by condensing dichloromaleic anhydride with an appropriate primary amine. The compounds may be used in solution in an organic solvent, a water dispersion or emulsion, or mixed in an inert dust.

Wood, toxic, pulp, fiberboard, slime, patent

PDL-41116

Centre International d'études pour la conservation et la restauration des biens culturels, Paris (Robert Deschiens and Christine Coste)
THE STRUGGLE AGAINST INSECT RAVAGERS OF WORKS OF ART IN SCULPTURED WOOD (in French with English summary)
Travaux et publications IV (1961) 51 p.

About 80% of existing ancient wooden art works are estimated to be infested with insects. Most of the insects belong to the Coleoptera, families Anobiidae, Lyctidae, and Cerambicidae. Occasional damage is caused by Isoptera (termites) or Hymenoptera. The wood-attacking Coleoptera as a rule have low moisture requirements; higher temperatures such as prevail in heated buildings and museums aid development. In search of wood nutrients (carbohydrates, proteins,

vitamins) the larvae and/or the adult forms bore a system of galleries through the attacked object. Most common and most detrimental genera of Anobiidae are: Anobium (A. striatum, A. pertinax, A. nitiolum), Xestobium (X. rufovillosum), Ptilinus, and Oligomerus. Among the Cerambicidae only one species, Hylotrupes bajulus, was found. Infestation with Lyctidae (genus Lyctus) is relatively rare. Since insects attack the interior of the wood, leaving the surface intact with the exception of few small holes (entrances to the galleries), infestation may remain undetected for long periods until extensive damage is done. Detailed visual examination of the surface, and the use of a stethoscope to amplify noises made by the insects are the best means of detection. Methods of control and prevention of infestation are based on introduction into the wood of toxic agents. Considerations in choice of insecticides are the age, dryness of the wood, the necessity to preservethe general appearance and plastic qualities of the object, and harmlessness to painted, lacquered, and decorated surfaces. The usual methods of impregnation such as immersion and steaming cannot be applied; only special delicate techniques can be used. These consist essentially in introducing the selected chemical in quantities sufficient to penetrate through the whole mass of the wood. The chemicals are injected by mean of syringes in solution in volatile solvents, or in the form of emulsions. Before being impregnated, the object is thoroughly cleaned mechanically. In controlling an existing infestation, the galleries made by the insects are used to distribute the injected solution through the wood. In preventive treatment, tiny perforations must be bored. To ensure long lasting effects, insecticides with strong residual action are chosen. Suitable chemicals include mono- and dichlorophenols, BHC and pentachlorophenol. Suitable volatile solvents include benzene, white spirit, toluene, xylene, and acetone. Because of the flammability and/or toxicity of the chemicals used, special safety measures must be taken to protect the operators, the buildings, and the art works themselves. When damage to the wood substance is extensive, treatment can be combined with a consolidation process, which consists in injecting solutions of plastic materials of sufficient elasticity, e.g., cellulose

acetate and vinyl and methacrylic resins. After evaporation of the solvent and solidification, the plastic fills all empty spaces and constitutes a reinforcing structure inside the wood. Injection techniques are the same as for insecticides.

Antiques, preservation, insects, toxics

PDL-41312

U.S. Puget Sound Naval Shipyard, Bremerton, Wash. Material Laboratories (R.F. England and E. Stahl)
MARINE LAMINATING PROPERTIES OF SELECTED WOOD SPECIES, TRUE HICKORY (CARYA SPECIES) UNTREATED AND TREATED WITH WATER-BORNE PRESERVATIVE
R&D Final Report E-412-8;...ASTIA Doc. 250202 (December 1960). 23 p.

Hickory specimens of mixed heartwood and sapwood, both untreated and treated with fluor-chrome-arsenate, could not be satisfactorily laminated with any of three marine service approved phenol-resorcinol adhesives. Lamination was carried out using the same processing conditions as for white oak heartwood - a single cure schedule of 150 F for 6 hr (center line) with both short and long closed assembly periods. Treatment with preservative did not noticeably affect gluability. Lamination was highly sensitive to assembly time, age of glue mix and difference in adhesives.

Wood, hickory, laminates, toxic, aqueous

PDL-41584

Nyuksha, Yu. P.
A MICROSCOPIC STUDY OF PAPER PIGMENTED BY THE FUNGUS GYMNOASCUS SETOSUS
Microbiology 29:98-101 (July/August 1960) (Translation of Mikrobiologiya. USSR 29:133-136 January-February 1960)

Fungi, paper, discoloration, biomechanism

Deterioration
NRC